USER MANUAL

DC and DCC Operation of Atlas Gold Series Diesel Locomotives

Equipped with ESU LokSound® Select Sound-Decoders

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Quick Start: Atlas Gold Series Diesels Equipped with LokSound Select Sound-Decoders

Congratulations on purchasing an Atlas N, HO, or 2-rail O-scale Gold Series locomotive that is equipped with an ESU LokSound® Select sound-decoder, an easy-to–use, versatile, and feature-packed Dual-Mode (DC or DCC) sound-decoder. The information in this section is designed to get you running your new sound-decoder-equipped diesel locomotive as quickly as possible, whether you are using conventional DC or DCC. Atlas recommends that you get used to running your new sound-equipped diesel locomotive before exploring its more advanced features and options. The following two sections describe how to operate your locomotive on a DC-powered layout and on a DCC-powered layout, respectively.

Quick Start for Analog (DC) Operation

Read through this section and be up and running with your new locomotive on a DC layout[1] in fewer than five minutes.

- **Running the Locomotive on DC**
  - Use a standard variable-voltage DC power pack.
  - Set the direction switch to run your locomotive forward.
  - Turn the DC throttle up slowly until you begin to hear locomotive sounds (around 5 volts). You will hear the diesel engine *Start-Up* sequence, which lasts about 25 seconds. ***The locomotive will NOT move before the Start-Up sequence has been completed.*** (If you don't like this delay, setting CV124 = 0 will eliminate the delay. See Example 1 in Appendix 4.)
  - The initial behavior of the front and rear headlights depends on the type of locomotive:
    - For a *yard or local switching locomotive*, the front and rear headlights will both turn on in their *Dim* states unless the locomotive is moving;
    - For a *road locomotive*, the headlight (front or rear) in the direction in which the locomotive will move will turn on in its *Dim* state; the headlight at the other end of the locomotive will be turned *Off*.
  - Once the start-up sequence has been completed, turn up the throttle voltage until the locomotive starts to move forward. In order make the locomotive move, you will have to turn the throttle to a higher setting (around 7 volts) than you would to start a non-sound locomotive that is running on DC power. The directional headlight that points in the direction of movement will turn from *Dim* to *Bright* and locomotive sounds will continue.
  - The locomotive will start out slowly due to built-in inertia that resists rapid changes in speed.[2]
  - As you slow the locomotive down by gradually reducing the throttle, squealing brake sounds will occur shortly before the locomotive comes to a halt.
- **Reversing the Locomotive on DC**
  - Reversing on DC is done in exactly the same manner as it is with non-sound locomotives.
  - Bring the locomotive to a stop, and turn the power all the way off.

[1] Atlas does not recommend that you operate the new N-Scale Gold Series S-2 Loco on DC track power.
[2] See Sections 2.1 and 2.2,

Back EMF (BEMF) Throttle Control and Normal Throttle Control starting on page 11 for further information on this feature.

- Flip the direction switch, and reapply power to go in the opposite direction.
- The directional headlights behave as follows for *yard or local switching locomotives*:
  - When the locomotive is moving *forward*, the front headlight will be *Bright*; when the locomotive is *stopped* or moving *backwards*, the front headlight will be *Dim*.
  - When the locomotive is moving *backward*, the rear headlight will be *Bright*; when the locomotive is *stopped* or moving *forward,* the rear headlight will be *Dim*.
- By contrast, the directional headlights behave as follows for *road locomotives*:
  - When the DCC direction button is set so that the locomotive can move *forward,* the front headlight will be *Dim* when the locomotive is *stopped* and *Bright* when the locomotive is moving *forward*.
  - When the DCC direction button is set so that the locomotive can move *backward*, the rear headlight will be *Dim* when the locomotive is *stopped* and *Bright* when the locomotive is moving *backward*.
  - The headlight (front or rear) that does not point in the direction of movement will be *Off*.

- **Blowing the Horn and Ringing the Bell**

  You cannot blow the horn, ring the bell, or control any other function (other than speed and direction) of a locomotive that is equipped with a LokSound Select decoder from a standard DC power pack. To control any additional functions, you must use either a *Basic* or a *Standard DCC System* instead of a DC power pack
  - A ***Basic DCC System*** typically allows you to do a few essential operations such as:
    - Operate (control the speed and direction) of one (sometimes more than one) locomotive,
    - Send DCC function button commands to control lighting, sound (e.g., Horn and bell), and certain other functions in the loco. To control all the functions available in the LokSound Select decoder, the *Basic or Standard DCC System* must support the following DCC functions

      F0, F1,……., F28,
    - Some, but not all, *Basic DCC Systems* have the built-in capability to program some (or all) CVs on the main line (*Ops Mode* programming). *Other Basic DCC Systems r*equire you to purchase an add-on handheld controller (or other additional equipment) to do this programming; a few starter DCC systems (not recommended by Atlas) offer no way to do CV programming other than replace the entire DCC system.
    - As of the date of this document, the available *Basic DCC Systems* include:
      - NCE DCC Twin,
      - MRC Prodigy Explorer DCC,
      - MRC TECH 6 Sound Controller 6.0 (usable in smaller scales, but primarily intended for O-scale and larger).
  - A ***Standard DCC System*** allows you to control **all** the functionality built into the LokSound Select sound-decoder.

  Most *Basic DCC Systems* are not much more complicated to operate than a normal DC power pack, but they allow you to blow the horn, ring the bell, and operate other functions that you cannot do with a DC power pack. *Basic DCC Systems* are often less expensive to purchase than *Standard DCC Systems*. However, unlike *Standard DCC Systems*, these Basic DCC Systems may or may not allow you to run two or more trains simultaneously on the same track, with independent control over each train. If you do not already have a DCC system, Atlas suggests that you carefully investigate both *Basic and Standard DCC Systems* before deciding which type of DCC system to purchase.

Quick Start for DCC Operation

If you have a layout powered by a DCC system that is compatible with the NMRA DCC specifications, read through this section and be up and running with your new Gold Series locomotive in fewer than five minutes.

RECOMMENDATION: If you are new to DCC, before delving further into this *DCC Quick Start*, Atlas strongly recommends that you read the (DCC manufacturer's) instruction manual that came with your DCC system, especially the sections that deal with:

- Running a (decoder-equipped) locomotive using that DCC system,
- Sending DCC function commands to the locomotive to operate the horn, bell, headlights, and other functions,
- Programming the CVs in your decoder *on the main line* (usually referred to as *Ops Mode* or *Operations Mode* programming).

Controlling Speed and Direction of Gold Series Locomotives on DCC

• Running the Locomotive on DCC – Basic Operation

- Select locomotive address #3 on your DCC system.
- Set your DCC system to use either 28 (OK) or 128 (better) speed steps.
- Make sure that all DCC track power is turned off. Then put your locomotive on the track, and turn the DCC power back on. When the locomotive is first powered up, the front headlight and/or rear headlight may not be turned on. If this is the case, press the *F0* (or *Headlight)* key on your DCC system one or two times to turn on the headlight(s). The initial behavior of the front and rear headlights depends on the type of locomotive:
  - For a *yard or local switching locomotive*, the front and rear headlights will both turn on in their *Dim* states unless the locomotive is moving;
  - For a *road locomotive*, the headlight (front or rear) in the direction in which the locomotive will move will turn on in its *Dim* state; the headlight at the other end of the locomotive will be *Off*.
- You will hear the diesel engine *Start-Up Sequence*, which lasts about 25 seconds. ***Even if you advance the throttle, the locomotive will NOT move before the Start-Up Sequence has been completed.*** (If you don't like this delay, setting CV124 = 0 will eliminate the delay. See Example 1 in Appendix 4.)
- After the *Start-Up Sequence* has been completed, turn up the DCC throttle until the locomotive starts to move forward (or backward). The directional front (or rear) headlight in the direction of movement will turn from *Dim* to *Bright,* and locomotive sounds will continue.
- If your Atlas sound-equipped locomotive has *Ditch Lights*[3], these lights will be turned on, in a steady (non-flashing) state, whenever the *F6* key is *On*. If you blow the Horn (with *F6 On* and the locomotive moving forward), the Ditch Lights will flash alternately.
- If your Atlas sound-equipped locomotive has a *Mars Light*[3], this light will start pulsing when the *F11* key is *On.*
- When *Back EMF* (*BEMF*) is turned *On* (the default setting) and DCC acceleration and deceleration are set to their default values
  - CV3 = 60,
  - CV4 = 40,

  there will be noticeable momentum in both acceleration and deceleration.
- As you slow the locomotive down by gradually reducing the throttle, squealing brake sounds will occur shortly before the locomotive comes to a halt.
- When you reduce the DCC throttle to zero, the locomotive will automatically enter the *Stopped* State after the locomotive stops moving.
  - Whichever headlight (front or rear) was on *Bright* when the locomotive was moving will turn *Dim* when the locomotive stops.

[3] Not all Atlas Gold Series locomotives have Ditch Lights or Mars Lights.

- If your Atlas sound-equipped locomotive has *Ditch Lights* and they are turned *On* (using *F6*), the Ditch Lights will turn *Off* in the *Stopped* State.
- If your Atlas locomotive has a *Mars Light* and it is turned on (using *F13*), the *Mars Light* will stop pulsing and go *Dim* when the locomotive stops.

- **Reversing the Locomotive on DCC**

Reversing with DCC is done in exactly the same manner as it is with non-sound locomotives.

- The direction of your locomotive will change when you press the direction button on your DCC throttle.
- The directional headlights behave as follows for *yard or local switching locomotives*, such as the S-2:
  - When the locomotive is moving *forward*, the front headlight will be *Bright*; when the locomotive is *stopped* or moving *backwards*, the front headlight will be *Dim*.
  - When the locomotive is moving *backward*, the rear headlight will be *Bright*; when the locomotive is *stopped* or moving *forward,* the rear headlight will be *Dim*.
- By contrast, the directional headlights behave as follows for *road locomotives,* such as the C424/C425 or the RS-1:
  - When the DCC direction button is set so that the locomotive can move *forward,* the front headlight will be *Dim* when the locomotive is *stopped* and *Bright* when the locomotive is moving *forward*.
  - When the DCC direction button is set so that the locomotive can move *backward*, the rear headlight will be *Dim* when the locomotive is *stopped* and *Bright* when the locomotive is moving *backward*.
  - The headlight (front or rear) that does not point in the direction of movement will be *Off*.

Controlling Sounds of Gold Series Locomotives on DCC

- **Blowing the Horn on DCC**

Blow the diesel locomotive horn for short or long blasts – you control the duration. The operation of the horn depends on how your DCC system was designed and configured.

- If your DCC system has separate *Horn* and *F2* keys,
  - Pressing the *Horn* key will blow the horn only for as long as you are holding the button down. This behavior is called *momentary* operation.
  - Pressing the *F2* key and releasing it will cause the horn to come on and stay on until you press *F2* again. This behavior is called *latching* operation.
- If your DCC system has only an *F2* key, this key may be set at the factory for either *latching* or *momentary* operation, depending on the DCC system. Some DCC systems allow the user to configure a function key (such as *F2*) for either *latching* or *momentary* operation.
- As discussed above, if your locomotive has *Ditch Lights*, they may be turned on and off with the *F6* function key. If the Ditch Lights are turned on (using *F6*), the locomotive is moving forward, and the *Horn* is blowing (*Horn* or *F2* key pressed), the *Ditch Lights* will flash alternately for as long as *F2* is pressed and will continue this alternate flashing for a short time after you release the *F2* or *Horn* key.

- **Ringing the Bell on DCC**

- You can turn the bell on and leave it on while you operate other functions on the locomotive.
- Turn the bell on by pressing the *Bell* or *F1* key on your DCC throttle
- The bell will stay on until you do another press of the *Bell* or *F1* key on your DCC throttle (or if you interrupt DCC track power).
- Turn the bell off with a second press of the *Bell* or *F1* key on your DCC throttle.

Note: When you turn the bell off, it will continue ringing briefly with less and less volume as the pneumatic clapper slows down, just like the prototype.

Programming a New DCC Address for Your Locomotive

The decoder in an Atlas Gold Series locomotive comes from the factory preset to the short DCC address "3." However, in order to control independently several locomotives on the same track at the same time, it is necessary that each locomotive on the layout have a different DCC address. A convenient choice for the DCC address is the road number (usually printed on the side of the locomotive's cab). Frequently, the road number is a 3 or 4 digit number, both of which are treated in DCC as *Long (4 digit) Addresses.*

Most *Standard DCC Systems* allow you to change the DCC address of a locomotive in either of two places:

- On a special section of track that is not connected in any way to your layout and is called the *Program Track*. (In DCC terminology, programming locomotives on the program track is called *Service Mode Programming*.)
- Anywhere on the regular track of your layout. [In DCC terminology, programming a locomotive on your layout trackage is called either *Programming on the Main (POM)* or *Operations Mode (Ops Mode) Programming*.]

If your DCC system allows you to program 4-digit addresses on the main line (many DCC systems do), Atlas recommends that you do so, using *Operations Mode* (*Ops Mode*)[4] programming. Table 6 in Section 4.2.3 shows, for most of the *Standard*[5] *DCC Systems* commonly sold in North America, both the systems that do and do not directly support 4-digit address programming on the main line. For those DCC systems that do NOT support *Ops Mode* address programming, this table suggests that you use one of the alternate address programming procedures that are described in Sections 0 and 4.2.3.3. For all other DCC systems, use the *Ops Mode* programming procedure that is described in Section 4.2.3.1.

Resetting your Lok-Sound Select Equipped Loco to Factory Default Values

Resetting the firmware in the LokSound Select sound-decoder to its factory-built configuration can resolve many problems that sometimes occur with firmware-controlled electronics. In fact, we have found that at least 20 to 25 percent of the problems with Gold Series locomotives that we receive for repair at Atlas can be resolved simply by resetting the sound-decoder. Hence, the very first step you take to resolve a problem should be to reset the LokSound Select sound-decoder in your locomotive.

Reset the decoder in your Atlas LokSound-equipped locomotive as follows:

- Place it on your program track and write the decimal value 8 into CV8.
- Cycle power to the decoder first off and then on again by:
  - Tipping the locomotive to one side so that all the wheels on the opposite side are off the rail,
  - Holding the locomotive in this tipped position for 5 to 10 seconds,
  - Slowly lowering the locomotive back down until all wheels are once again on the program track rails.

The second step listed above (power cycling) is ***extremely*** important; do ***not*** omit it.

[4] Digitrax Zephyr and Zephyr DCC systems that do NOT have a DT400 or DT402 throttle connected to them are an exception. These systems allow 4-digit address programming on the main line, but only if they are first switched to use Digitrax's *Blast Mode* programming. See Section 4.2.3.2.

[5] *Basic DCC Systems* DO NOT support 4-digit address programming.

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1 Introduction

Congratulations on purchasing an Atlas N, HO, or 2-rail O-scale Gold Series diesel locomotive equipped with an ESU LokSound Select sound-decoder. This dual-mode sound-decoder is easy-to-use, versatile, and feature-packed.

The previous version (1.26) of this *User Manual* contained information that applied to all Atlas locomotives equipped with ESU LokSound Select decoders as well as specific information that applied to each of the first five Atlas Gold Series locomotives with ESU decoders.

- Atlas HO-scale Gold Series RS-3,
- Atlas HO-scale Gold Series S-2,
- Atlas HO-scale Gold Series C424/C425,
- Atlas HO-scale Gold Series RS-1,
- Atlas N-scale Gold Series S-2.

This style was used because a certain number of changes and enhancements to the ESU firmware were made for each of these five new Atlas Gold Series locomotives. However, the number of ESU firmware changes has stabilized. As a result, this *User Manual* will no longer be updated to reflect the ESU firmware changes for a particular new Atlas Gold Series locomotive. Instead, you should consult the *Quick Start Guide* that comes with your locomotive (or this *Guide* can be downloaded from an Atlas website that is listed in the documentation that comes with your locomotive). In particular, you should use the table entitled DCC *Function Key Operation* in the *Quick Start Guide* for your locomotive instead of Table 1 (*Typical Default DCC Function Key Operation)* that appears in this document.

Since it is possible that there may be additional firmware changes for future Atlas Gold Series locomotives, it is strongly recommended that you check the Atlas Model website for the latest *Quick Start Guide* for your locomotive as well as possible updates to this *User Manual*. The URL of the atlas website is:

http://www.atlasrr.com/

To download manuals, choose *Support*, *DCC Support*, and then double click on the listing for the document you wish to download.

Atlas and ESU documentation for Gold Series locomotives is available at three levels:

- **Basic-Level Information**: The information at the basic level is designed to get you running your new Gold Series locomotive, on either conventional DC or on DCC, as quickly as possible. This basic level information is contained in the document *Quick Start Guide: Atlas Gold Series* (locomotive scale and model, e.g., *HO Scale C424/C425*) *Diesel Locos equipped with ESU LokSound Select Sound-Decoders*.[1]. A paper copy of the appropriate *Quick Start Guide* is included with each new Atlas locomotive that is equipped with a LokSound Select sound decoder. Because different Atlas locomotive models have somewhat different features (e.g., the available choices for diesel horns) the *Quick Start Guide* included with each locomotive is not generic, but is tailored specifically to that locomotive. If you have no prior experience with sound-equipped locomotives, the *DC Quick Start* or *DCC Quick Start* sections at the beginning of this *User Manual* (pages 2 to 6) may also be useful.

- **Intermediate-Level Information**: The *Atlas Gold Series Diesel Locomotive User Manual* that you are now reading explains how to use the major features provided in the LokSound Select sound-decoder, such as controlling the various available sound effects:
  - Air-Brakes,
  - Dynamic Brakes,
  - Shut Down and Start Up,
  - Manual and Automatic Notching.

  Also included in this document are instructions for
  - Adjusting the volumes of various sounds,
  - Setting locomotive DCC addresses,
  - Changing between Back EMF Throttle Control (a variation on cruise control that uses back EMF to control the speed) and Normal Throttle Control,
  - Resetting all the parameters in the decoder to their default values.

Some (but not all) of these features apply to DC operation as well as to DCC operation.

- **Advanced-Level Information:** You will need advanced-level documentation for the ESU LokSound Select sound-decoder if you wish to do more complex operations such as:
  - Remapping DCC functions so that a different function key controls a particular sound-decoder feature,
  - Programming the lights of the locomotives in a consist so that only the appropriate lights of each locomotive are illuminated,
  - Controlling various parameters of lighting behavior (dimming, flashing, directionality, etc.),
  - Adjusting various parameters (timeouts, ramp up rates, etc.).

Some examples that show how to modify the default behavior of certain LokSound features are included in Appendix 4 of this document. All of these changes will be in effect when you are operating on a DCC layout, and some of them will also be in effect when operating on a standard DC layout

Since Advanced-Level information about ESU LokSound Select sound-decoders is NOT included in this document, if you want to know the details of how a particular feature works, you may wish to refer to the *LokSound Select User Manual for Diesel and Steam Decoders*.[2] The *LokSound Select User Manual* contains definitions of the CVs used in LokSound Select sound-decoders and includes examples of how to program various combinations of CVs to obtain particular locomotive behaviors. However, not all the information in the *LokSound Select User Manual* applies to Atlas Gold Series locomotives. ESU allows model railroad manufacturers to specify manufacturer-unique default values for a number of parameters such as specific sound volumes and DCC function mappings. The values for all Atlas-unique parameters are given in this *Atlas User Manual* and take precedence over corresponding generic values that appear in the *LokSound Select User Manual for Diesel and Steam Decoders*.
You can download the current version of to the *LokSound Select User Manual* from the ESU website:
http://www.esu.eu/en/start/
by first selecting *Downloads.* Then click on *Instruction manuals*. Next, click on *Digital decoders.* Finally, single-click on the *Download* icon in the box labeled *LokSound Select Diesel & Steam Users Manual.*

The *LokSound V4.0 Instruction Manual* [3] is also useful in understanding some of the more complex features.

Road Map to the Remainder of this Document

If your Atlas Gold Series locomotive is running on conventional DC power, you should read Section 2 (*Analog Features*) and Section 3 (*Automatic Features*) of this manual. If your Gold Series locomotive is running on DCC, you should read Section 3 (*Automatic Features*) and Section 4 (*DCC Features*) of this manual. Finally, Section 6 (*Troubleshooting*) should be read by both DC users and DCC users.

2 Analog Features

Locomotive speed and direction can be controlled from any variable-voltage DC power pack[6], but using the other features available in LokSound Select sound-decoders requires either a *Basic DCC System* or a *Standard DCC System*. See the discussion under *Blowing the Horn and Ringing the Bell* on page 3 of this document.

2.1 Starting the Locomotive

Most model railroad variable-voltage DC power packs are suitable for analog operation of Atlas sound-equipped locomotives. The modern electronic-type power packs will usually provide better performance than older non-electronic packs. When operated with a standard DC power pack, your Atlas sound-equipped diesel locomotive starts and stops quite differently from non-sound-equipped locomotives that you may have operated. Unlike standard non-sound DC locomotives that begin to move at very low track voltages, sound-equipped locomotives require a minimum amount of DC voltage (typically around 5 volts) to power up the sound-decoder electronics. Also, if Back EMF (BEMF) is turned on (the default condition is BEMF on), the response of the locomotive to the throttle is slower - more like that of a real locomotive.

[6] Atlas does not recommend that you operate the new N-Scale Gold Series S-2 Loco on DC track power.

Turn the throttle up slowly until you hear the sounds of the diesel engine in your locomotive starting up***. The locomotive will NOT move before this Start-Up sequence has been completed.*** (If you don't like this delay, you can eliminate it by changing the value of CV124 as described in Example 1 of Appendix 4.) In addition, the appropriate (*Front* and/or *Rear) Headlights* will turn on in the *Dim* state. (See Table 2 and Table 3 in Section 0; these tables summarize the *Front Headlight* and *Rear Headlight* behavior for *Yard/Local Switching* and *Road* locomotives, respectively.)

After the *Start-Up* sequence has been completed, continue to turn up the throttle voltage (to about 7 volts) until the locomotive starts to move in *Forward* (or *Reverse*). The diesel engine (*Prime Mover*) sounds will rev up with labored sounds proportional to the locomotive's acceleration and loading, and the locomotive will slowly start to move. The headlight in the direction of movement (*Front Headlight* if moving forward and *Rear Headlight* for movement backwards) will switch from *Dim* to *Bright*.

Locomotive Inertia Effects

Your new locomotive is pre-programmed at the factory to use *Back EMF (BEMF)* in both conventional DC (analog) and DCC operation. BEMF makes your locomotive operate as though it has the inertia of a prototype locomotive. As a result, your locomotive will resist starting up too quickly if at rest and will resist changes in speed once moving. [For more information on BEMF, see Section 2.2 below, *Back EMF (BEMF) Throttle Control and Normal Throttle Control*.] It takes a little practice to learn to move the throttle slowly and wait until the locomotive responds. If you prefer that your locomotive respond almost immediately to throttle movements on your DC power pack, it may be reprogrammed (using a *Basic* or *Standard DCC System*) to use *Normal Throttle Control* and have little or no momentum if you also set CV3 = 6 and CV4 = 0.

As you slow the locomotive down by gradually reducing the throttle to a little below the voltage at which it started moving in analog, the volumes of the diesel engine rev and labored sounds decrease, and you will hear *Squealing Brake Sounds* as the locomotive comes to a stop

2.2 Back EMF (BEMF) Throttle Control and Normal Throttle Control (DC and DCC)

Atlas locomotives with LokSound Select sound-decoders have two types of throttle control available: *Normal* (no BEMF) and *BEMF*. Both *Normal* throttle control and *BEMF* throttle control will apply more power to the motor as the DC track voltage increases, beginning at the voltage at which the locomotive first begins to move. In addition, BEMF includes a motor speed control feature that prevents the locomotive from reacting too quickly to changes in track voltage or to minor problems such as misaligned track joints, tight curves, rough track work through turnouts, crossings, etc. A locomotive operating under *Normal Throttle Control* may come to an unrealistic halt because of a raised track joint or a drop in voltage; while the same locomotive under *BEMF Throttle Control* will continue at the same speed. BEMF operates your locomotive as though it had the inertia of a real locomotive; your locomotive will resist changes in speed once it is moving and will resist starting up too quickly if at rest. You will be able to operate your locomotive at very slow prototypical speeds without having to adjust your throttle continually in order to maintain the same speed.

The type of throttle control also affects how your locomotive decelerates. Under *Normal Throttle Control*, your locomotive will respond quickly to a reduction in track voltage. Under *BEMF Throttle Control*, your locomotive will decelerate slowly as you bring the throttle setting down. If you decrease the throttle setting below the voltage at which the locomotive first began to move, the moving locomotive will slowly come to a stop.

Selecting Throttle Mode for a Loco to be Operated on a DC Layout

Although you need a basic or standard DCC system to make the change, you can switch between the factory-default setting of BEMF Throttle Control and Normal Throttle Control by writing the proper value into CV49

- Setting CV49 = 18 selects Normal Throttle Control
- Setting CV49 = 19 selects BEMF Throttle Control

Even after you turn off BEMF (by setting CV49 = 18), there will still be some momentum unless you also reduce the values of CV3 and CV4 from their default settings. Atlas suggests starting with the following new values:

- CV3 = 6,
- CV4 = 0.

3 Automatic Features (DC and DCC)

Your Atlas Gold Series Diesel locomotive equipped with an ESU LokSound® Select sound-decoder has a number of features that operate automatically. These features fall into three areas:

- Motor control
- Lighting control
- Sound control

Most of these features apply to both DC operation and DCC operation. Sometimes, the only difference between the operation of a feature in DC and in DCC is that it is possible to turn the feature on or off in DCC; whereas, the feature (e.g., *Diesel Engine Sound*) is always on in DC.

Back EMF motor control was discussed in Section 2.2. Table 2 and Table 3 in Section 0 show how the headlight brightness changes automatically in either DC or DCC operation.

Most of the other automatically-controlled features are various sounds. They will be discussed below in alphabetical order.

Air Compressor: When a locomotive is sitting still, the *Air Pumps (Air Compressor)* come on to replace the air lost from the brake air release or any other air-operated appliances. Once the pressure is up, the pumps run only occasionally to maintain air pressure. Air pumps are operated directly from the diesel engine and are quite noticeable when turned on in a non-moving locomotive. However, these sounds are difficult to hear when the locomotive is moving. *Air Compressor* sounds are played randomly. If desired, you can change the minimum and maximum delays between the playing of *Air Compressor Sounds* by using CV61 and CV62, respectively. For more information, see Section 5.2.7.10 of the *LokSound Select User Manual for Diesel and Steam Decoders*.[2]

Brake Squeal: You can hear the *Brake Squeal* on prototype locomotives when the locomotive is moving slowly, and this noise can become particularly loud when the wheels are just about to stop turning. Listen at slow speeds for automatic *Brake Squeal* sounds and the final distinctive squealing sounds as the diesel locomotive slows to a stop.

Diesel Engine Notching: The LokSound Select sound-decoder allows the diesel engine (prime mover) to be operated with all eight notches corresponding to the throttle notches used on the prototype. As the throttle is turned up, the diesel engine RPM will increase in fixed increments until the maximum RPM occurs at notch 8. The above operation occurs automatically, with no input from the operator required. In addition, notching can be controlled manually in DCC. For more information on *Automatic* and *Manual Notching*, see Section 4.1.9.

Diesel Turbo: On many modern diesels, turbochargers are used to increase the horsepower of the engine by pumping air under pressure into the intake manifold. The power to operate the turbo comes from the exhaust pressure of the diesel engine, which causes the high-pitched whine of the turbo to lag the revving of the engine.

Start-Up Sound Sequence: When you first turn up DC or DCC track power, you will hear a set of sounds representative of what you would hear if you were standing next to a prototype diesel when it starts up. The *Start-Up* sounds vary depending on the make and model of the prototype diesel being modeled. The *Start-Up* sound sequence can last up to 25 seconds, during which time the locomotive will not move. (If you don't like this delay, you can eliminate it by changing the value of CV124 as described in Example 1 of Appendix 4.)

Short Air Release: Compressed air is used on locomotives for operating various appliances. You will hear a *Short Air Release* at various random times

4 DCC Features

This section describes the DCC features available with the LokSound Select sound-decoder and how to use them.

4.1 Function Keys

Table 1 lists the features that are typically pre-assigned to DCC function keys in an Atlas Gold Series locomotive equipped with a LokSound Select Sound Decoder. After you have selected the DCC address of the locomotive on your DCC system, simply press the corresponding DCC function key to produce the desired effect. The entries in this table apply to the first five Atlas Gold Series locomotives that have ESU LokSound Select sound-decoders:

- Atlas HO-scale Gold Series RS-3,
- Atlas HO-scale Gold Series S-2,
- Atlas HO-scale Gold Series C424/C425,
- Atlas HO-scale Gold Series RS-1,
- Atlas N-scale Gold Series S-2.

Since the operation of DCC functions varies among different Atlas Gold Series locomotives, Atlas recommends (rather than using Table 1) that you use the table of *DCC Function Key Operation* in the *Quick Start Guide* that was included with your locomotive.

Table 1 – Typical Default DCC Function Key Operation[7] for Atlas Gold Series Locomotives with ESU LokSound Select Decoders

Function Key	Locomotive Behavior when Press Function Key	Function Operation (Latching or Non-latching)	Works Only With Engine Sounds On	Works Only When Loco Moving
F0[8,9]	Front Headlight and Rear Headlight are directional. See Table 2 and Table 3.	Latching	No	No
F1	Bell (1st push *On*; 2nd push *Off*)	Latching	No	No
F2	Horn blows until push F2 key again[10]	Latching	No	No
Horn	Horn blows only while Horn key held down	Non-Latching		
F3	Two Coupler Clank sounds alternate	Non-Latching	No	No
F4	Diesel Fans (1st push *On*; 2nd push *Off*)	Latching	Yes	Yes (RS-3 & S-2) No (C424/C425, RS-1)
F5	Dynamic Brake (1st push *On*; 2nd push *Off*) Only active when prime mover sound *On*.	Latching	Yes	Yes
F6	Optional Ditch Lights (1st push *On*; 2nd push *Off*)	Latching	-	-
F7	Switching Mode (1st push *On*; 2nd push *Off*)	Latching	No	No
F8	Audio Mute and Start Up or Shut Down (Push twice if *F8* is currently *On*)	Latching	No	No

[7] This table applies to the first five Atlas Gold Series locomotives with LokSound Select decoders (HO RS-3, HO S-2, HO C424/C425, HO RS-1, and N-scale S-2). If you wish to change the function mappings used in your LokSound Select decoder, it is best to use ESU's LokProgrammer software. See Appendix 4.

[8] Depending on the DCC system, the *F0* key may be labeled in different ways such as "*F0*," "*Headlight*," or with a light bulb symbol.

[9] The state of *F0* and the direction the train is moving will activate and deactivate the automatic behavior of the Front Headlight and Rear Headlight.

[10] If *F2* is configured for non-latching operation, it will operate in the same way as the *Horn* key

.

Table 1 (continued) – Typical Default DCC Function Key Operation for Atlas Gold Series Locomotives with ESU LokSound Select Decoders

Function Key	Locomotive Behavior when Press Function Key	Function Operation (Latching or Non-latching)	Works Only With Engine Sounds On	Works Only When Moving
F9	Manual Notching Up sounds (1st push *On*; 2nd push *Off*) See Section 4.1.9.	Latching	Yes	No
F10	Manual Notching Down sounds (1st push *On*; 2nd push *Off*) See Section 4.1.9.	Latching	Yes	No
F11	AUX3 Function Output (1st push on/2nd push off) Preset to MARS light	Latching	-	-
F12	Dim Headlight (1st push *Dim*; 2nd push *Bright*)	Latching	No	Yes
F13	AUX4 Func Output (1st push *On* /2nd push *Off*)	Latching	-	-
F14	Talking Defect Detector sounds	RS-3 or S-2: press *F14* twice C424/C425 or RS-1: sounds play each time *F14* is pressed	No	No
F15	Cab Radio Communication sounds	RS-3 or S-2: press *F15* twice C424/C425 or RS-1: sounds play each time *F15* is pressed	No	No
F16	Rail-Joint Clank sounds (1st push *On*; 2nd push *Off*) Only active when prime mover sound *On*	Latching	Yes	Yes
F17	Brake Set/Release sounds with each push	Non-Latching	Yes	Yes
F18	Sanding Valve sounds (1st push *On*; 2nd push *Off*)	Latching	Yes	No
F19	Short Air Let-Off sounds	Latching (always press *F19* twice)	No	No
F20	Air Compressor sounds (1st push *On* /2nd push *Off*)	Latching	Yes	No
F21	Pop Valve sounds (1st push *On* /2nd push *Off*)	Latching	No	No

The reason why Atlas recommends in the above table that you press certain function keys (*F14*, *F15*, and *F19* for the RS-3 and S-2, but only *F19* for the C424/C425 and RS-1) **twice** is that certain actions will *ONLY* happen in the LokSound Select decoder if the corresponding DCC function is *Off* at the time you press the function key. Hence, by pressing the function key twice, the function is guaranteed to be *Off* during one of the two presses.

In addition to the 22 functions (*F0* and *F1* to *F21*) defined in Table 1, the LokSound Select decoder in your Atlas Gold Series locomotive also supports seven additional user-definable DCC functions *F22* to *F28*. Consult the *LokSound Select User Manual* [1] for information. If you wish to configure any of these additional functions to do a certain operation, Atlas recommends that you use ESU's LokProgrammer software. You can download this software for free. You need not purchase the ESU LokProgrammer hardware since the needed programming can be done with your existing DCC system. For further information, see Appendix 4.

Directional Headlight Operation - (F0 or Headlight button)

The *F0* or *Headlight* DCC function key turns *On* or *Off* the directional front headlight and rear headlight.[11]

[11] Explicit lighting control features for the front headlight, rear headlight, and (where applicable) other lights can be assigned to various DCC function outputs. (For details see the *LokSound Select User Manual*.[1])

The defaults for the front headlight and rear headlight are *Off*. When switched *On*, the Directional Headlights[12] operate as shown in Table 2 for *yard or local switching locomotives* (such as the S-2) and in Table 3 for *road locomotives* (such as the C424/C435 and RS-1). These two different types of headlight behavior (one for yard or local switching locomotives and the other for road locomotives) mimic, to the extent possible, the way prototype locomotives operate.

Table 2 - Directional Headlight Operation in DCC and DC for Yard or Local Switching Locomotives

Light	Forward	Stopped after Forward	Reverse	Stopped after Reverse
Front Headlight	Bright	Dim	Dim	Dim
Rear Headlight	Dim	Dim	Bright	Dim

Table 3 - Directional Headlight Operation in DC and DCC for Road Locomotives

Light	Forward	Stopped after Forward	Reverse	Stopped after Reverse
Front Headlight	Bright	Dim	Off	Off
Rear Headlight	Off	Off	Bright	Dim

The behaviors shown in Table 2 and Table 3 simulate the operation of the headlights on a prototype locomotive when the engineer follows Rule 5.9.1 (formerly Rule 17) in *GCOR*[4]. The word "simulates" is used in the preceding sentence because prototype headlights are not automatic but are instead manually controlled by the locomotive engineer.

There are two separate headlight switches in a prototype locomotive:

- One for the front headlight,
- One for the rear headlight.

Each headlight switch on a prototype locomotive has positions for *Bright*, *Dim*, and *Off*.

Just as you dim your headlights when you approach another car going the opposite direction on the road, Rule 5.9.1 (or its equivalent) in most prototypical North American railroad rulebooks requires that engineers of oncoming passing trains dim their headlights as the two trains approach each other so as not to blind the other engineer. You can simulate this action by using the *F12* key to dim the front headlight of a locomotive that is moving forward as it passes another train moving in the opposite direction. See also Section 4.1.11.

There are other circumstances (besides passing a train that is going the opposite direction) where the headlight must either be dimmed or else turned off. The situations under which headlights must be dimmed are specified in the Rule Book that a particular railroad uses. For example many Western railroads in the USA use the *General Code of Operating Rules (GCOR*[4]). Rule 5.9.1 in the *GCOR* states[13] that:

> **The engineer must turn the headlight on bright to the front of every train, except when the engine is approaching and passing over a public crossing at grade. Furthermore, the engineer must dim the headlight during any of the following additional conditions:**
>
> - **At stations and in yards where switching is being done,**
> - **When the engine is stopped close behind another train,**
> - **In non-signaled territory, when the engine is stopped on the main track waiting for an approaching train,**
> - **When approaching and passing the head end and rear end of a train on the adjacent track.**

When two or more prototype diesels are consisted, the rear light switch will control the rear-facing headlight in the last unit (even if the light happens to be the front headlight of that unit). A set of light engines (engines not pulling a train) running on the main will have the front headlight of the first unit on *Bright* and the rear-most headlight on the rear unit

[12] The LokSound Select decoder uses constant voltage lighting that is independent of track voltage.
[13] This wording is from the *General Code of Operating Rules (CCOR)*, Sixth Edition, April 7, 2010, pages 5-11 and 5-12.

on *Off* or *Dim* (on *Dim* as a safety measure). All other headlights in the consist would normally be *Off*. If you wish to mimic this behavior, you may use CV21 and CV22 to get the desired lighting operation, as explained in Section 5.2.3 of the *LokSound Select User Manual*[2].

4.1.1 Bell - (F1 or Bell), DCC only

Diesel locomotives usually have pneumatically-operated mechanical bells. You can choose between a slow-ringing bell and a fast-ringing bell using CV48. See Section 5.2.7.3 in Reference [2] for more information.

Some DCC throttles have separate *Horn* and *Bell* buttons along with their normal Function Keys. Pressing the *F1* or *Bell* key and releasing it will cause the bell to come on and stay on until you press *F1* again. There is no difference in operation between the *Bell* button and its corresponding Function Key (*F1*).

4.1.2 Horn - (F2 or Horn), DCC only

The LokSound Select sound-decoder uses authentic diesel locomotive horn sounds. All horns are engineered by ESU LokSound sound experts to give you the most authentic effects. If you blow the horn briefly, you will produce a realistic short horn sound.

The horn is assigned *by* default to DCC function key *F2*. Depending on the design of the DCC system, the *F2* key may behave differently from the *Horn* key. For example, the *F2* and *Horn* keys on an NCE DCC system operate as follows:

- Pressing the *F2* key and releasing it will cause the horn to come on and stay on, until you press *F2* again (latching behavior).
- Pressing the *Horn* key will blow the horn only as long as you are holding the button down (non-latching behavior).

In DCC systems without a separate *Horn* key, the *F2* key is often, but not always, configured for non-latching operation.

4.1.3 Coupler Clank Sounds - (F3), DCC only

The LokSound Select sound-decoder provides two different sets of coupler sounds. If you press the *F3* key, you will hear one set of coupler sounds. If you press this key again, you will hear a different set of coupler sounds.

4.1.4 Diesel Fan - (F4), DCC only

The diesel engines and generators inside the diesel locomotive body need ventilation in order to stay cool. Hence, all diesel locomotives have powerful cooling fans under their roof to draw outside air through louvers on the sides of the locomotive. The outside air is blown across large radiators.

Pressing the *F4* key and releasing it will cause the sounds of the *Diesel Fans* to come on and stay on until you press the *F4* key again. The cooling fan in RS-3 and S-2 Gold Series locomotives can be turned on only when the locomotive is moving. In C424/C425 and RS-1 locomotives, the cooling fan can be turned on whether or not the locomotive is moving.

4.1.5 Dynamic Brake Fans - (F5), DCC only

Electric motors can act as motors or generators depending on whether they are using power or generating power. When used as generators, the traction motors are disconnected from taking power from the locomotive's generator or alternator and instead are connected to large resistor grids mounted under the locomotive roof. By increasing the resistive load on the traction motors, the traction motors become harder to turn and act as brakes for the locomotive. The electric power generated by turning the traction motors is dissipated as heat by the resistor grid. These resistor arrays get quite hot and require fan cooling. When dynamic brakes are turned on in a LokSound-equipped diesel locomotive, the diesel engine sound drops to notch 1, and the *Dynamic Brake Cooling Fan* sounds come on.

***If and only if the Prime Mover sound is turned on AND the locomotive is moving*, pressing the *F5* key and releasing it will cause the sound of the Dynamic Brake Fans to come on and stay on until you press the *F5* key a second time.**

4.1.6 Directional Ditch Light Operation - (F6), optional feature, DCC only

In DCC Operation, The Ditch lights are turned on using the *F6* key. Once turned on (or in DC operation), the *Ditch Lights* will behave as shown in Table 4

Table 4 - Directional Operation of (Optional) Ditch Lights (when Ditch Lights turned on)

Type of Light	Forward	Stopped after Forward	Reverse	Stopped after Reverse
Ditch Lights	On or flashing	Off	Off	Off

The *Ditch Lights* flash alternately when the locomotive is moving *Forward* and the *Horn* is being blown.

4.1.7 Switching Mode Operation - (F7), DCC only

When *Switching Mode* is turned on (using the *F7* function key), the maximum speed of the locomotive is reduced by about 50 percent. This speed reduction gives you smoother control of your locomotive in the lower speed ranges, which is important for switching. Press *F7* again to return to normal operation.

4.1.8 Mute/Unmute and Shutdown/Start Up - (F8), DCC only

The *F8* function key is used for two purposes:

- Muting and unmuting the diesel engine (prime mover) sounds
- Triggering the *Shut Down* and *Start Up* sound sequences

The above two operations take place simultaneously as will be explained below.

Muting and Unmuting Diesel Engine (Prime Mover) Sounds

The LokSound Select sound-decoder allows you to turn on or off the *Prime Mover* (diesel engine) sounds using the *F8* function key. This capability is very useful whenever you need to reduce the sound level to engage in a conversation or to answer the phone. If you have many trains operating at once, you can turn off the *Prime Mover* sounds on the locomotives that are running in the rear of the layout and increase the volume of the closest locomotive. Press the *F8* key in the *Stopped* or *Forward/Reverse* states to gradually decrease or increase the locomotive's volume between no sound and full volume.

***Note*:** Depending on the current state of DCC function *F8*, you may need to press this function key twice to mute the sound.

Note*:** For the first two Atlas locomotives with LokSound Select decoders (RS-3 and S2), the mute/un-mute state ***IS maintained if power is turned off and back on again; hence if the locomotive sound was muted when track power is turned off, it will still be muted when power is turned back on. However, for the C424/C425 and future Atlas Gold Series locomotives, the mute state is ***NOT*** maintained if track power is turned off and back on; the *Prime Mover* sounds will return to their full volume setting upon power up.

Triggering Shut-Down and Start-Up Sounds

- **Shut-Down:** When diesel engine sounds are *On* ***AND*** the locomotive is stopped, pressing the *F8* function key initiates a *Shut-Down* sound sequence. At the conclusion of this sequence, the diesel engine sounds will be turned off. (If the locomotive is moving when you press the *F8* function key, the *Shut-Down* sound sequence will not play, and the locomotive sounds will be muted rapidly.)

  Note: After the diesel sounds have been turned off, you can still operate (silently) the locomotive with your DCC speed control and direction switch. Although there will be no diesel engine (*Prime Mover*) sounds, you can still trigger and hear the *Bell* (*F1*), *Horn* (*F2*), *Cab Radio Communication* (*F15*), and other sounds by pressing the appropriate function keys

- **Start-Up:** When diesel engine sounds are *Off* ***AND*** the locomotive is stopped, pressing the *F8* function key initiates a *Start-Up* sound sequence. For the entire duration of this *Start-Up* sound sequence up to 25 seconds), the locomotive will not move even if the DCC throttle is advanced. If you prefer not to have this behavior, you can eliminate the delay in movement by setting CV124 to either 0 or 16, depending on whether you wish to use either a *Variable* or a *Constant BEMF Regulation Frequency*, respectively. (For further information on reducing BEMF noise, please see Section 4.2.7.)

4.1.9 Automatic and Manual Diesel Notching - (F9 and F10), DCC only for Manual Notching

Most diesel locomotives use *Throttle Notches* to determine how much power the diesel engine is supplying to the generator, which in turn supplies electrical power to the traction motors. Normally, the number of *Notches* is eight. The engineer selects whichever one of *Notch 1* through *Notch 8* is needed when he/she is operating the locomotive. Since there is no direct connection between the diesel engine and the driving wheels, engine RPM is fully decoupled from the speed of the locomotive over the rails. Therefore, a locomotive may be moving at 15 mph when going up a grade with a heavy train pulling hard in *Notch 8* at full RPM, or it may be coasting down a hill at 60 mph with the diesel engine idling at *Notch 1*. The LokSound Select decoder installed in your Atlas Gold Series locomotive allows you to model this characteristic diesel engine behavior on your layout. There are two alternatives for simulating the notching behavior of diesel locomotives on your layout:

- *Automatic Notching (AN)*: the LokSound Select sound-decoder controls the generation of notching sounds automatically;
- *Manual Notching (MN)*: you, the engineer, control the generation of *Notching Sounds* using the controls on your DCC throttle.

Automatic Notching: The LokSound Select sound-decoder has all eight of the diesel engine throttle *Notches* that are found on prototype locomotives. As you increase the throttle, you will hear the RPM's increase for every increase in ten speed steps (at the 128 speed step setting). *Idle* is considered *Notch 1* and occurs at speed step 0. *Notch 2* ranges from speed step 1 to speed step 10, *Notch 3* from steps 11 to 20, *Notch 4* from steps 21 to 30, etc.

Manual Notching (MN): *Manual Notching* is easy to use. Two DCC function keys are used to control *Manual Notching (MN):* one key (*F9*) for *Notch Up* and the other key *(F10*) for *Notch Down*, *MN* can be engaged either when the model is stopped with (the sound of) the diesel engine running or else engaged on the fly after the locomotive moves off in the normal manner.

Both the *F9* and *F10* function keys ***MUST*** be in their *Off* states before they can be used to trigger either *Notch Up* (*F9* key) or *Notch Down (F10* key*)* sound effects. If you don't know how to determine whether a DCC function is *Off* or *On*, consult the User Manual for your DCC system or check with the DCC system manufacturer. The following procedures for engaging and disengaging *Manual Notching* assume (as is the case with most DCC systems) that both the *F9* and the *F10* function keys operate in a *Latching* manner.

To engage manual notching, proceed as described below.

Engaging Manual Notching

Proceed as follows to engage *Manual Notching*:

- Make sure that both functions *F9* and *F10* are turned *Off* before engaging Manual Notching.
- **When the locomotive is stopped**, press the *F9* (*Notch Up*); key; the LokSound Select decoder will notch up the drive RPM sound as determined by the height of each notch and will go through all 8 notches, unless the *F9* function key is turned off. However, if DCC function *F9* is turned off, the locomotive sound will stay at the notch at which it was when function *F9* was turned off. It is important to turn function *F9 Off* after you have completed the *Notching Up* scenario because if you fail to do so, you will be unable to initiate the *Notching Down* sound effects.

  After turning function *F9 Off*, you can press the *F10 (Notch Down)* function key to move the diesel engine RPM sound back to *Idle*. As with *Notching Up*, you can alternatively press the *F10* function key a second time to turn *F10* off before the *Prime Mover* sound goes back to *Idle* so that the sound will go down to a lower notch, but above *Idle*. Once again, turn function *F10 Off* after you have completed the *Notching Down* scenario so that the locomotive will be ready for the next Manual Notching session.

- **When the locomotive is moving,** the basic operation of the *Manual Notching* feature is the same; the engine sounds are fully decoupled from the speed of the locomotive so that you can simulate the full spectrum of locomotive operation just as you observe when you are watching operating prototype locomotives in action.

To disengage manual notching, proceed as described below.

Disengaging Manual Notching

Proceed as follows to disengage Manual Notching:

- Verify that the engine sounds have returned to idle. If you are unsure, turn DCC function *F9 Off* and turn DCC function *F10 On.* After pressing the *F10* key to turn the *Notching Down* feature *On*, wait until you hear the engine sounds go down to idle.
- After verifying that engine sounds are at idle, turn the *Notching Down* feature *Off* by pressing the *F10* function key again. Also verify (if you haven't done so already) that DCC function *F9* is turned *Off*.
- Make sure that the locomotive is stopped.

If *and only if* all three of the above three conditions are satisfied

- *Automatic Notching* will resume once the locomotive starts moving;
- You can resume *Manual Notching* at any time by following the procedures described above under *Engaging Manual Notching*.

Manual Notching can be engaged again whenever you desire. You do not need to change any CVs to switch between *Manual Notching* and *Automatic Notching*. This change can be done "on the fly" whenever you wish to do so.

4.1.10 Directional Mars Light Operation - (F11), optional feature, DCC only

The *F11* function key turns on the (optional) *Mars Light*, after which the Mars Light behaves as shown in the table below.

Table 5 - Directional Operation of (Optional) Mars Light (when Mars Light turned on)

Light	Forward	Stopped after Forward	Reverse	Stopped after Reverse
Mars Light	Pulsing	Dim	Dim	Dim

4.1.11 Manual Headlight Dimming - (F12), DCC only

If you wish to simulate the headlight dimming required by (prototype) Rule 5.9.1 or its equivalent (formerly Rule 17), press the *F12* key to dim the headlight in the direction in which the locomotive is moving and press this key again to un-dim the headlight. When power to the locomotive is turned off, the dimmed state is *not* remembered. For additional information, see Section 0.

4.1.12 Controlling AUX4 Function Output - (F13), DCC only

Pressing the *F13* function key turns on whatever device (if any) is connected between the Aux4 terminal and the function common terminal on the LokSound sound-decoder; pressing *F13* again turns it off. If nothing is connected to these terminals, pressing the *F13* key will have no effect.

4.1.13 Controlling Talking Defect Detector Sounds - (F14), DCC only

The operation of the *F14* function key depends on the type of Atlas locomotive:

- For an HO-scale RS-3 or an HO-scale or N-scale S2, always press *F14* twice;
- For an HO-scale C424/C425 or an HO-scale RS-1, you need to press *F14* only once since the sounds play every time *F14* is pressed.

4.1.14 Controlling Cab Radio Communication Sounds - (F15), DCC only

The operation of the *F15* function key depends on the type of Atlas locomotive:

- For an HO-scale RS-3 or an HO-scale or N-scale S2, always press *F15* twice;
- For an HO-scale C424/C425 or an HO-scale RS-1, you need to press *F15* only once since the sounds play every time *F15* is pressed.

4.1.15 Controlling Rail-Joint Clank Sounds) – (F16), DCC only

Pressing the *F16* function key turns on a sound record of simulated sounds of the *clanking noise of a locomotive traveling over jointed rails*; pressing *F16* again turns these sounds off. ***Rail-joint clank sounds are played only when the prime mover (diesel engine) sounds are turned On (using F8).***

4.1.16 Brake Set/Brake Release Sounds - (F17), DCC only

Each time the *F17* function key is pressed, a sound record of either simulated *Brake Set* sounds or simulated *Brake Release* sounds is played. The played sound alternates between *Brake Set* and *Brake Release.*

4.1.17 Controlling Sanding Valve Sounds - (F18), DCC only

Pressing the *F18* function key turns on a sound record of simulated sounds of *opening the sanding valve* of a locomotive; pressing *F18* again turns these sounds off.

4.1.18 Controlling Short Air Let-Off Sounds - (F19), DCC only

Pressing the *F19* function key twice plays (one time only) a sound record of a simulated *Short Air Let-Off*. Pressing *F19* twice more plays this same sound record another time.

4.1.19 Controlling Air Compressor Sounds - (F20), DCC only

Pressing the *F20* function key turns on the sound record of a locomotive *air compressor*; pressing *F20* again shuts this sound record off.

4.1.20 Controlling Pop Valve Sounds - (F21), DCC only

Pressing the *F21* function key turns on a sound record of simulated *sounds of opening and closing the pop valve* of a locomotive*;* pressing *F21* again turns this sound record off.

4.2 DCC Programming

If you wish to change any of the lighting, sound, or other parameters, you must use a DCC system (either *Basic* or *Standard*) to change the values of this (these) parameter(s). The parameters are called *Configuration Variables* (or *CVs* for short) and are stored in the memory of the sound-decoder. Note that DCC programming is ***required*** in order to change any sound-decoder parameters, whether your locomotive is normally operated on a DCC layout or on a DC layout.

4.2.1 Where to Program

Most *Standard DCC Systems* allow you to program decoders in either of two places:

- On a special section of track that is not connected in any way to your layout and is called the *Program Track*. (In DCC terminology, programming locomotives on the Program Track is called *Service Mode Programming*.)
- Anywhere on your regular layout trackage. [In DCC terminology, programming a locomotive on your normal layout track is called either *Programming on the Main (POM)* or *Operations Mode (Ops Mode) Programming*.]

Unlike many sound-equipped locomotives, your Atlas Gold Series diesel with a LokSound Select sound-decoder normally does ***not*** need a *Program Track Booster* to read and write CVs on the program track. However, if you are having trouble programming CVs on the program track, see Section 6.3, *Program Track Operation* for information on Program Track Boosters. Alternatively, you always have the option to program CVs on the main line using *Operations Mode (Ops Mode)* programming.

Certain DCC systems cannot program CVs numbered above 255 (e.g., CV317). If you are having difficulty programming these higher-numbered CVs, see Appendix 5, *Considerations for Programming CVs Numbered over 255* on page 42.

4.2.2 Programming Indexed CVs

LokSound Select sound-decoders, like sound-decoders from certain other manufacturers, use *Indexed CVs* to reduce the amount of memory needed to store Configuration Variables. In this *Atlas Locomotive User Manual*[14], a *Singly-Indexed*[15] *Configuration Variable (CV)* will always be written in the form:

CVx.y

where **x** is the number of the *Indexed CV* and **y**, the *Low Index*, is the value stored in the *Low Index Register* ***CV32***. For example, in order to assign the value 16 to the indexed Configuration Variable **CV403.2**, the following two CVs must be programmed as specified below ***and in the order specified****:*

CV32 = 2
CV403 = 16

Four rules ***must*** be observed whenever indexed CVs are programmed:

- The *Low Index Register* **CV32** must ***always*** be programmed ***before*** the indexed configuration variable **CVx.y** is programmed.
- The ***only*** allowable values for the *Low Index Register* **CV32** are 0, 1, 2, and 3.
- Currently the only CVs that are indexed in LokSound Select decoders are the ones numbered from CV257 to CV511.
- There is another Index Register, the *High Index Register* **CV31,** whose value does not change when programming any of the CVs discussed in this Atlas *User Manual*. It is ***essential*** that **CV31** be kept at its default value of 16 for successful programming of any of the CVs discussed in this *User Manual*.

Many DCC systems can program Indexed CVs without any problem. However, there are a few exceptions.

- Certain Digitrax and NCE DCC systems cannot directly program CVs numbered at or above 256. See Appendix 5 for a list of these DCC systems and a work-around for programming higher-numbered CVs.
- If you own a DCC system made by someone other than Digitrax or NCE and are having programming problems, check with your DCC system manufacturer.

4.2.3 Programming a New DCC Address for Your Locomotive

The most commonly programmed item in a DCC locomotive is the address. The reasons why this statement is true are:

- The decoders in DCC locomotives normally come from the factory set to use the short address 3.
- However, in order to control independently multiple locomotives on the same track at the same time, it is necessary that each of these locomotives have a different address.

Most model railroaders pick as an address the road number, which is usually printed on the side of the locomotive cab. Quite frequently, the road number is a 3- or 4-digit number, which DCC treats as a *Long (or 4-digit) Address*.

Many people prefer to use *Operations Mode (Ops Mode)* programming to change the address of their locomotives. In order to use *Ops Mode*, your DCC system must allow you to program 4-digit addresses on the main line. (Many DCC systems do allow this programming.) Table 6 below lists some DCC systems commonly sold in North America that do and do not support direct 4-digit address programming on the main line. For those (relatively few) DCC systems that do NOT support *Ops Mode* address programming, references are given to one of two alternate programming procedures (defined later in this section). For all other DCC systems, use the programming procedure in Section 4.2.3.1.

[14] Note that the *LokSound Select User Manual for Diesel and Steam Decoders* [2] does **NOT** use this notation.

[15] ESU has defined two index registers (the *High Index Register* ***CV31*** and the *Low Index Register* ***CV32***) thus making possible doubly-indexed CVs. However, all of the CVs discussed in this Atlas User Manual are singly-indexed CVs that use the *Low Index Register* ***CV32*** as the only index register that changes value. The value of the *High Index Register* ***CV31*** must always be kept at 16.

Table 6 – Methods for Programming 4-Digit Address on Main Line for Various DCC Systems

DCC System Manufacturer	Model	Support 4-Digit Address Programming in Ops Mode	Recommended 4-digit Address Programming Procedure
Bachman	EZ-Command	No	Not recommended for use with Atlas Gold Series locomotives
Bachman	Dynamis	No	Use procedure in Section 4.2.3.3 or use Program Track
CVP Products	EasyDCC	No	Use procedure in Section 4.2.3.3 or use Program Track
Digitrax	Zephyr or Zephyr xtra **without** a DT400/402 throttle	No	Use procedure in Section 4.2.3.2 or use Program Track
Digitrax	Empire Builder, Super Chief, or Zephyr/Zephyr xtra **with** a DT400/402 throttle	Yes	Use procedure in Section 4.2.3.1
Lenz	Compact or (Atlas) Commander	No	Not recommended for use with Atlas Gold Series locomotives
Lenz	All other Lenz DCC systems With Ver. 3.6 or later software	No	Use procedure in Section 4.2.3.3 or use Program Track
MRC	Prodigy Express, Prodigy Advance and Advance[2] or Prodigy Wireless	Yes	Use procedure in Section 4.2.3.1
NCE	Power Cab or Power Pro	Yes	Use procedure in Section 4.2.3.1

4.2.3.1 Normal Procedure for Long (4-Digit) Address Programming of Gold Series Locomotives on Main Line (works with most DCC systems)

In order to program a *Long (4-digit)* address in Ops Mode, when your Atlas Gold Series locomotives currently has a Short (2-digit) address or vice versa, use the following procedure (with most DCC systems).

1. First, operate the locomotive on the main line using its current DCC address.
2. If you cannot determine the DCC address that will run the locomotive, move the locomotive to your *program track*, and reset the LokSound Select decoder in your locomotive. Follow the reset procedure described in Section 4.2.6. After the reset, make sure that the locomotive can be operated with the default DCC address 3.
3. Follow the procedure in your DCC system manual for programming a new address using Operations Mode programming on the main line. After you have programmed the long address, make sure that your DCC system has activated this long address, i.e., that it has set CV29 to a value that supports 4-digit addresses (see Section 4.2.4). In particular, if you have a Digitrax DCC system that has a DT400 or DT402 throttle, be certain to press the "*Y+"* key **IMMEDIATELY** after you see "*Ad4on?=y*" displayed on the throttle screen.
4. Change your DCC system from its configuration for Operations Mode programming to its configuration for running a locomotive on the main line (if your DCC system doesn't perform this reconfiguration automatically).
5. Verify that the locomotive can operate on the main line using its new 4-digit address.

4.2.3.2 Special Procedure for Long (4-Digit) Address Programming on Main Line with Digitrax Zephyr or Zephyr xtra DCC Systems

Note: If you have a DT400 or DT402 throttle plugged into your Zephyr or Zephyr xtra DCC system, you do NOT need to use the procedure described in this section. Instead, use the procedure described in the previous section (Section 4.2.3.1).

1. Put your locomotive on the main track and run it on DCC using address 3 (or whatever other address you have programmed into the locomotive). If you can't determine the address, reset the locomotive using the procedure described in Section 4.2.6. Then test run the locomotive on DCC using the main track and DCC address 3.
2. Turn Option Switch 7 "on" so that you can use Digitrax's *Blast Mode* programming feature:
    a. Press the **PROG** key on your Zephyr or Zephyr xtra DCC system;
    b. Press the **SWITCH** key;
    c. Use the keyboard to enter *07*, which is the number of the Option Switch that you need to turn on;
    d. Press the **c/-** key to turn Option Switch *07* "*On*;"
    e. Press the **EXIT** key when you are finished setting Option Switch 7.
3. If you took the locomotive to be programmed off the main track, put it back on the main track. If DCC track power is off, turn it back on using the **POWER** key on the Zephyr or Zephyr xtra. Make sure that the locomotive to be programmed still runs on DCC using address 3 (or whatever other address you have programmed into it).
4. Keep pressing the **PROG** key until you see *PAGE* on the Zephyr's or Zephyr xtra's display.
5. Keep pressing the **LOCO** key until you see *AD4* on the Zephyr's or Zephyr xtra's display.
6. Use the keyboard to enter the 4-digit address that you wish to program (e.g., 1234 or any other address between 128 and 9983).
7. When you have finished entering the 4-digit address into the Zephyr or Zephyr xtra, write this new address into your locomotive by pressing the **CV-WR** key. Do not be surprised if the locomotive leaps forward when the programming takes place. This movement doesn't always happen, but it can.
8. To exit Blast Mode programming on the main line, press the **EXIT** key on your Zephyr or Zephyr xtra.
9. To run the locomotive whose address you entered in Steps 6 and 7, press the **LOCO** key; re-enter the address you entered in these two steps (using the Zephyr or Zephyr xtra keyboard); and press the **LOCO** key again.
10. Verify that the locomotive runs using its new address.
11. If the locomotive did not run in Step 10 when you used its new address,
    a. Turn off DCC track power and move the locomotive that you are trying to program from the main line to the program track.
    b. Using Direct Mode programming, read the values of CV29 and AD4. For 4-digit addresses, the value of CV29 should be 38 and AD4 should be the address that you entered in Step 7.
    c. If either or both of these values are not correct, change it (them). You may make any necessary changes in Direct Mode while the locomotive is on the program track.
12. Turn off Blast Mode programming by changing the setting of Option Switch 07 to "*Off*."
    a. Press the **PROG** key and then press the **SWITCH** key.
    b. Use the keyboard to enter *07*, which is the number of the Option Switch that you need to turn off.
    c. Press the **t/+** key to turn Option Switch *07* "*Off*."
    d. Press the **EXIT** key when you are finished resetting Option Switch 7.

4.2.3.3 Special Procedures for Long Address Programming on the Main Line for Bachman Dynamis, CVP Products EasyDCC, or Lenz DCC Systems

The EasyDCC system from CVP Products, the Bachman Dynamis system, and Lenz (Ver. 3.6 or later) DCC systems all allow you to program on the main line the two CVs that hold a 4-digit DCC address (CV17 and CV18), but they do not allow you to program the 4-digit address directly.

1. Determine the values of CV17 and CV18 that correspond to your locomotive's 3- or 4-digit ID number either by using one of the CV17/CV18 calculators available on the internet such as
   http://ruppweb.dyndns.org/xray/comp/decoder.htm
   or else by following the instructions for calculating the values of CV17 and CV18 in Section 9.1 of the *LokSound Select User Manual*. [2]
2. Using Operations Mode Programming, program CV17 to the value that you calculated in Step 1.
3. Using Operations Mode Programming, program CV18 to the value that you calculated in Step 1.
4. Using Operations Mode Programming, program CV29 to the value 38.
5. Verify that the address of your locomotive has been changed successfully changed by running it on the main line using its new 4-digit address.

If the address has NOT been changed successfully, put the locomotive on your program track, and read the address and the value of CV29. If either the address or the value of CV29 is incorrect, correct the error(s) by re-programming them on your program track.

4.2.4 Selecting a Value for CV29

CV29 is the second most often programmed CV (after the DCC address CV or CVs). Moreover, CV29 is the most important of all the Configuration Variables in DCC. Each bit in CV29 controls one basic operational setting for a DCC decoder, such as *Extended (4-digit) Addressing*, user-defined *Speed Table Enable/Disable*, *Power Source Conversion* (operate on either DC or DCC or only on DCC), *Locomotive Direction*, and others. The default value of CV29 is 14, which is equivalent to CV29 = 6 if RailCom or RailCom Plus is not active.[16] Table 7 on the next page provides some of the more common values for CV29 and the features that these values support for the case where neither RailCom nor RailCom Plus is active.

RailCom, originally developed by Lenz, provides a method for two-way communication between a DCC decoder and a DCC command station. RailCom Plus is an enhancement to RailCom that was developed by ESU. All LokSound Select sound-decoders support both RailCom and RailCom Plus. However, for RailCom or RailCom Plus to be active, two conditions must be present:

- Bit number 3 of CV29 (when bits are numbered in the North American way from 0 to 7) must have the binary value "1," which is equivalent to adding "8" to the decimal value of CV29;
- The DCC command station must support RailCom or RailCom Plus.

No DCC systems from North American DCC manufacturers support RailCom; to Atlas's knowledge, the only DCC systems that do support RailCom are from European DCC companies.

Choosing the proper value for CV29 depends on whether your DCC system supports RailCom or does not:

- If your command station does support RailCom or RailCom Plus, to activate RailCom or RailCom Plus, add "8" to the values shown in Table 7.
- If your command station does not support RailCom or RailCom Plus, it makes no difference what value is in bit number 3 of CV29. Hence, you can use, without modification, the CV29 values listed in Table 7.

[16] Since the default value of CV29 is 14, if you program a long address, many, but not all, DCC systems will simply add 32 to this default value, resulting in CV29 = 14 + 32 = 46 rather than the customary value CV29 = 38 for long addresses.

Table 7 - Available Features for Various Values of CV29 WITHOUT Activating RailCom/RailCom Plus

If You Want this Set of Features					Write this Decimal Value into CV29
2- or 4-Digit Addressing	Activate Alternate Speed Table (CV67–CV94)?	Locomotive Operates on DC?	Locomotive Uses 28 or 128 Speed Steps	Normal Direction of Locomotive	
2	No	No	Yes	Forward	2
2	No	Yes	Yes	Forward	6[17]
2	Yes	No	Yes	Forward	18
2	Yes	Yes	Yes	Forward	22
4	No	No	Yes	Forward	34
4	No	Yes	Yes	Forward	38[17]
4	Yes	No	Yes	Forward	50
4	Yes	Yes	Yes	Forward	54
2	No	No	Yes	Reversed	3
2	No	Yes	Yes	Reversed	7
2	Yes	No	Yes	Reversed	19
2	Yes	Yes	Yes	Reversed	23
4	No	No	Yes	Reversed	35
4	No	Yes	Yes	Reversed	39
4	Yes	No	Yes	Reversed	51
4	Yes	Yes	Yes	Reversed	55

For more information on CV29, see Section 7 of the *LokSound Select User Manual for Diesel and Steam Decoders* [2].

4.2.5 Selecting the Throttle Mode for a Loco to be Operated on a DC or DCC Layout

By changing the value of CV49 you can specify that the locomotive should use either Normal or Back EMF (BEMF) throttle control.

Selecting the Throttle Mode for a Loco to be Operated on a DCC Layout

With DCC, you switch between the factory-default setting of BEMF Throttle Control and Normal Throttle Control in the same way as you do with DC operation: by writing the proper value into CV49.

- Setting CV49 = 18 selects Normal Throttle Control;
- Setting CV49 = 19 selects BEMF Throttle Control.

In addition to selecting Back EMF or not, CV49 is used to specify three other parameters. The CV49 values listed keep these three other parameters at their default values. For further information, see Section 5.2.4.5 and Section 7 of the *LokSound Select User Manual for Diesel and Steam Decoders*.[2] Please note that there will still be considerable momentum even after Back EMF is turned off if CV3 and CV4 are left at their default values of

- CV3 = 40
- CV4 = 56

To reduce this momentum, start by programming the following values into CV3 and CV4.

- CV3 =6
- CV4 =0

[17] The two most-commonly used values for CV29 are 6 (for a 2-digit address) and 38 (for a 4-digit address).

4.2.6 Reset all CVs to their Factory-Default Values

Reset all CVs in your Atlas Gold Series locomotive to their factory default values as follows:

Reset all CVs to their Factory-Default Values:

- Place the locomotive on your program track.
- Program the number 8 into CV8.
- Cycle power to the decoder first off and then on again by doing the following steps:
  - Tip the locomotive to one side so that all the wheels on the opposite side are off the rail.
  - Hold the locomotive in this tipped position for 5 or 10 seconds.
  - Slowly lower the locomotive back down until all wheels are once again on the rails.

The second bullet item above (power cycling) is extremely important. **DO NOT OMIT IT**. It may take up to 8 seconds for all CVs to return to their default values. For more details, see Section 5.1.7 in Ref. [2].

4.2.7 Reducing Noise from BEMF Circuitry

ESU has determined that the background noise generated by the BEMF circuitry can be reduced by using CV124 to specify that the BEMF circuitry use an *Adaptive Regulation Frequency* instead of a *Constant Regulation Frequency*. This change is made by setting bit number 4 of CV124 (when bits are numbered in the North American way from 0 to 7) to the binary value "1," which is equivalent to adding "16" to the current decimal value of CV124. This modification to the behavior of the LokSound Select decoder was first implemented in Atlas Gold Series HO-scale RS-1 and N-scale S-2 locomotives and is planned to be used in future Atlas locomotives that use LokSound Select decoders. With this change, the new default value of CV124 is 20. If you wish to convert an older Atlas Gold Series locomotive equipped with a LokSound Select decoder to use a Constant Regulation Frequency, make one of the following changes to the value of CV124:

- Set CV124 = 16 if you want no *Prime Mover Startup Delay*[18];
- Set CV124 = 20 if you want to retain *Prime Mover Startup Delay*.

4.2.8 Changing the Master Volume (CV63)

The *Master Volume* CV controls the volume of all sounds.

Changing the Master Volume Level

To change the *Master Volume* in Service or Operations Mode, do the following:

- Enter the desired System Volume in CV63. The *Master Volume* can be set to any value between 0 (no sound) and 192 (maximum volume). The default value of the *Master Volume* parameter is 192.
- When you change the *Master Volume* in Operations Mode, you will immediately hear the LokSound sound system operating at the new volume.

[18] See Example 1 in Appendix 4 for further information on *Prime Mover Startup Delay*.

4.2.9 Changing Individual Sound Volumes (CV259.1 through CV371.1)

Table 8 lists the Indexed CVs used to change the volumes of Individual Diesel Sounds as well as their default values.

Table 8 - Using Indexed CVs to Change Volume of an Individual Diesel Sound

Individual Diesel Sound	CV32 Value	CV # for Individual Sound	Individual Sound Indexed CV	Individual Sound CV Default Value	Individual Sound CV Value Range	Resulting Volume
Diesel Engine Volume	1	259	259.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Horn Volume	1	275	275.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Bell Volume	1	283	283.1	99	0-128	0= Min. Vol.; 128= Max. Vol.
Coupler Sound Volume	1	291	291.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Dynamic Brake Fan Volume	1	299	299.1	70	0-128	0= Min. Vol.; 128= Max. Vol.
Air Compressor Volume	1	307	307.1	50	0-128	0= Min. Vol.; 128= Max. Vol.
Radiator Fan Volume	1	315	315.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Detector Sound Volume	1	323	323.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Crossing Comm. Sound Volume	1	331	331.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Rail Clank Sound Volume	1	339	339.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Brake-Set/Brake-Release Vol.	1	347	347.1	40	0-128	0= Min. Vol.; 128= Max. Vol.
Sanding valve Sound Volume	1	355	355.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Short Air Let Off Volume	1	363	363.1	128	0-128	0= Min. Vol.; 128= Max. Vol.
Short Air Horn Volume	1	371	363.1	128	0-128	0= Min. Vol.; 128= Max. Vol.

Note: The default volume level for each type of sound (fifth column of Table 8) varies.
Note: If you have trouble programming CVs numbered above 255, see Appendix 5 for a work-around for programming these higher-numbered CVs.

Changing Individual Sound Volumes

To change the volume of any one of the individual sounds listed in Table 8, perform the following steps[1]:

1. Set CV31, the High Index Register, to "16" (CV31 = 16). [Not always necessary, but recommended]
2. Set CV32, the Low Index Register, to "1" (CV32 = 1).
3. Set the CV number to the CV number listed in the third column of Table 8 that corresponds to the individual sound whose volume you wish to change (e.g., CV259 for the diesel engine sound volume).
4. Program the desired volume level into the CV whose number you set in the step 2. The values written into the individual sound volume control CVs are interpreted as follows:
    a. Value "0" = No sound,
    b. Values "1 – 128" set volume from the lowest level at "1" to the highest level at "128."

When you adjust individual sound volume levels, please keep in mind that you should not specify too high volume levels for individual sounds in order to avoid a condition called "clipping" which occurs when the sum of two or more signals exceeds the capacity of the audio amplifier in the decoder. Clipping can be identified by clicking or popping sounds. To avoid this situation, consider which sounds are likely to be played at the same time and take care that their corresponding volume levels are not set too high.

4.2.10 Speed-Matching

If you wish to consist two locomotives together, in order to avoid mechanical damage to one or both locomotives in the consist, it is important that the velocities of the two locomotives closely match each other over the entire range of speeds at which they operate.

If you are speed-matching a locomotive that has a LokSound Select decoder to another locomotive whose decoder does **not** have BEMF, you should turn off BEMF in the LokSound-Select-equipped locomotive (set CV49 = 18; see Section 4.2.5) before trying to speed-match. You may also need to reduce or eliminate any momentum that is specified in CV3 and CV4.

The LokSound Select sound-decoder in your Atlas Gold Series locomotive provides two ways to match locomotive speeds, which will be explained in the next two subsections.

4.2.10.1 Speed-Matching with a 3-Point Speed Curve

Speed-matching with a 3-point speed curve is done in the same way as it is with any other NMRA-compliant sound-decoder that supports CV2 (Vstart), CV5 (Vhigh), and CV6 (Vmid). Put the two locos to be speed-matched on an oval of DCC-powered track. Make sure that the two locomotives are NOT coupled together and remain uncoupled for the entire speed-matching process. Use *Ops Mode* programming to change the values of CV2, CV5, and CV6 in the following order (assuming that both locomotives are set to 28 speed steps):

- Adjust CV2 of one or both locomotives to get the best speed match at speed step #1;
- Adjust CV5 of the faster locomotive to lower the speed of this faster locomotive so that it matches the speed of the slower locomotive at speed step #28;
- Adjust CV6 of the faster locomotive to lower the speed of this faster locomotive so that it matches the speed of the slower locomotive at speed step #14;
- Repeat the above three steps (in the same order: CV2, CV5, and CV6) until the match is as good as you can get at all speeds.

4.2.10.2 Speed-Matching with a 28-Point Speed Curve

In most cases, using a 3-point speed curve is perfectly satisfactory for speed-matching the locomotives in a consist. If, however, you wish to set speeds more accurately, an NMRA standard 28-point speed curve is available in CV67 to CV94. Atlas recommends that you use one of the software programming systems, such as ESU LokProgrammer or DecoderPro to speed-match with 28-point speed curves. Remember that you must set Bit 4 of CV29 to a binary "1" before you can use the 28-point speed table (see Table 7**).**

5 Selection of Alternate Sounds (CV48)[19]

The LokSound Select sound-decoder installed in your Atlas Gold Series diesel locomotive allows you to change the sounds produced by the decoder to suit your preferences. In particular, this sound-decoder permits you to select from up to:

- Up to four different prime mover sound sets,
- Up to sixteen different air horns,[20]
- Two different bells,
- Two different brake squeals.

If the sounds that you would like to use are stored in the flash memory of the LokSound Select decoder that is installed in your locomotive, there is no need to download a new sound set from the Internet. You can simply pick the prime mover, air horn, bell, and brake-squeal sounds that you desire to use, program these selections into CV48, and you will have a locomotive with the sounds that you wish it to have. To compute the value for CV 48, follow the instructions in subsections 5.2.7.1, 5.2.7.2, 5.2.7.3, and 5.2.7.4 of the *LokSound Select User Manual for Diesel and Steam Decoders*.[2] Please be aware that the above sound-selection process is available ***only*** if the desired sounds

[19] Not all features described here are included in every Atlas Gold Series locomotive.
[20] Starting with the HO- and N-scale S-2 locomotives, the *Quick Start Guide* packed with your Atlas locomotive will list the available horns.

have been stored in the flash memory of your LokSound Select decoder.[21] ***With Ops Mode programming on certain DCC systems, it is necessary to cycle track power first Off and then On again for the changed value of CV48 to take effect.***

6 Troubleshooting

For a more complete description of the troubleshooting process than is given here, see the *troubleshooting* sections in the *LokSound Select Diesel and Steam User Manual for Diesel & Steam Decoders* [2]. You can identify the *troubleshooting* sections in Reference [2] by their yellow background shading.

6.1 The Basics

Many problems with sound-equipped locomotives are caused by one or both of the following two conditions:

- Dirt on the track, on the wheels (particularly on the locomotive, but also on any rolling stock being pulled by the locomotive), or on electrical pickup strips in the locomotive that rub on the wheels or axles
- Scrambled firmware or parameters (CVs) in the sound-decoder.

Clean your track and wheels first. Ordinary rubbing alcohol (from the drug store or grocery) poured onto paper towels does a good job cleaning track and wheels.

The wheel cleaning process is easier and quicker to do than it is to describe. To clean locomotive wheels:

- Cut a piece of paper towel that is slightly larger than one truck of the locomotive;
- Moisten the paper towel with rubbing alcohol;
- Put the paper towel on some track that can be (but is not yet) powered;
- Put the locomotive on this track with one truck completely on the moistened pad and the other truck on the bare rails;
- Hold the locomotive while you turn up the power until you see that the locomotive wheels on the piece of paper towel are turning. If the wheels are dirty, you will see black streaks of dirt from the loco wheels rubbing against the paper towel;
- Keep running the locomotive until the wheels on the first truck are clean;
- Make a second paper towel pad and moisten it with alcohol. Put the wheels of the second truck on the clean pad. Repeat the above cleaning process on the second truck.

Once you have clean track and wheels, reset your locomotive using the procedure described in Section 4.2.6. Now try running the reset locomotive**. Do NOT change any CV values (INCUDING THE DCC ADDRESS) until AFTER you have tested the locomotive using the default parameter values.**

6.2 Excess Voltage Circuit Protection (DC and DCC)

Your locomotive is designed to operate on the normal DC track voltage supplied by most variable-voltage DC power packs and/or the normal DCC track voltage supplied by DCC systems. For either DC or DCC, if the track voltage exceeds a safe value, the motor drive circuit will automatically shut down, and the locomotive will coast to a stop.

6.3 Program Track Operation (DCC)

This locomotive conforms to NMRA standards for program track operation. Unlike many sound-equipped locomotives, your Atlas Gold Series diesel with a LokSound Select sound-decoder normally does ***not*** need a *program track booster* to read and write CVs on the program track. However, if you cannot program your Atlas Gold Series locomotive on the program track, you have three choices:

- Add a program track booster between the program track output of your DCC system and the program track. If you need a program track booster, Atlas recommends the PTB-100 from SoundTraxx.
- All CV's in your locomotive can be programmed on the main line in Ops Mode. If you don't know the loco's current address, before programming on the main, you will have to reset the sound-decoder so that it uses the default DCC short address 3.

[21] Starting with the N-scale and HO-scale S2 locomotives and the HO-scale C424/C425 locomotives, the Atlas *Quick Start Guides* will list the available horns.

- If the only CVs you are having trouble programming on the program track are those numbered above 255, see Appendix 5.

6.4 Reasons Why Your Locomotive is Silent or Will Not Start (DC and DCC)

In case your locomotive remains silent after power up and turning the power off for 15 seconds does not return it to normal operation, try the following suggestions to bring your locomotive back to normal operation.

- Make sure the locomotive has not been Muted with the *F8* Key.
- Check to see if your digital volume has been turned all the way down.
- If the above methods do not restore your locomotive to normal operation, reset the sound-decoder in your locomotive to its factory default values using CV8, as described in Section 4.2.6

REFERENCES

[1]. *Quick Start Guide: Atlas Gold Series* (locomotive scale and model, e.g., *HO Scale C424/C425*) *Diesel Locomotives equipped with ESU LokSound Select Sound-Decoders,* The exact title, version number, and date of this document will be different for each Atlas locomotive. A paper copy of the *Quick Start Guide* is packed with each new Atlas Gold Series locomotive. Electronic copies are available on the Atlas Model website:

http://www.atlasrr.com/

by choosing *Support*, *DCC Support*, and then double clicking on the document that you want.

[2]. *LokSound Select User Manual for Diesel and Steam Decoders,* Third Edition (or later), May 2012. You can download the ESU *LokSound Select User Manual* from the ESU website:

http://www.esu.eu/en/start/

by first selecting *DOWNLOADS.* Then click on *Instruction manuals*. Next, click on *Digital decoders.* Finally, single-click on the *Download* icon that is inside the box labeled *LokSound Select Diesel/Steam Users Manual.*

Although the *LokSound Select Diesel/Steam User Manual* is relatively complete with detailed explanations of how the LokSound Select sound-decoder works, it does not contain Atlas-specific parameter values. These Atlas-specific values are contained in the *Atlas User Manual* that you are reading.

[3]. *LokSound V4.0 Instruction Manual,* Fourth Edition (or later), May 2012. You can download the ESU *LokSound V4.0 Instruction Manual* from the ESU website:

http://www.esu.eu/en/start/

by first selecting *DOWNLOADS*. Then click on *Instruction manuals*. Next, click on *Digital decoders*. Finally, single-click on the Download icon that is inside the box labeled *Instruction manual for LokSound V4.0 family*

LokSound Select sound-decoders have many, but not all, of the same features as LokSound V4.0 sound-decoders. The above LokSound V4.0 manual is useful in understanding certain features that are not fully explained in the LokSound Select User Manual

[4]. *General Code of Operating Rules (GCOR)*, Sixth Edition, April 7, 2010,

http://www.utu1904.com/files/Download/GCOR_6th_ed.pdf

Appendix 1. LokSound Select Features Available for DC and DCC

Sounds & Features Common to Analog & DCC	Analog-Only Features	Features Available With either Basic or Standard DCC Systems
Back EMF Motor Control Diesel Engine (Prime Mover) Sounds Automatic Diesel Engine Notching Diesel Turbo Sounds (optional) Automatic Brake Squeal Short Air Release Air Pumps Idle Sounds in Stopped State Directional Front Headlight Directional Rear Headlight Ditch Lights (optional) Mars Light (optional)	Change Analog DC Starting Voltage Change Analog DC Vmax	User-Triggered Horn User-Triggered Bell Overall System Volume Control Individual Sound Volume Control F0 Headlight Control F1-F28 Function Keys 14/28/128 Speed Steps Manual Diesel Engine Notching Controllable Coupler Sounds Controllable Radiator Fan Controllable Dynamic Brake Fan Programming Modes Supported: Service Mode, Direct Mode, Ops Mode

Appendix 2. NMRA-Specified CVs Used in LokSound Select Decoders

CV	Name	Description	Type	Range Of Values	Atlas Default Value
CV1	Short Address	Short (2-digit) address of loco	NMRA	1 -127	3
CV2	Start Voltage	Sets minimum speed of loco	NMRA	0 – 255	3
CV3	Acceleration Rate	Value multiplied by 0.25 is time in seconds from stop to max speed	NMRA	0 – 255	60[22]
CV4	Deceleration Rate	Value multiplied by 0.25 is time in seconds from max speed to stop	NMRA	0 – 255	40[22]
CV5	Vmax	Speed at highest speed step If Vmax = 0, use default max. speed of 255	NMRA	0 – 255	255
CV6	Vmid	Speed at middle speed step (step 14 for 28 steps, step 63 for 128 speed steps)	NMRA	0 – 255	128[22]
CV7	Version Number	This CV stores the version number of the decoder (not currently used)	NMRA	-	255
CV8	Manufacturers ID	This CV contains the Manufacturer's ID of the decoder In addition, setting CV8 = 8 ***and*** cycling power first *Off*, then *On* again, resets the sound-decoder	NMRA	-	151
CV17	Extended Address	Long (4-digit) address; see Section 4.2.3 for programming information.	NMRA	0 - 255	0[23]
CV18				0 - 255	0
CV19	Advanced Consist Address	Address for operating an Advanced Consist; see Section 5.2.3 in Ref. [2] for programming info.	NMRA	1 - 127	0
CV21	Consist Mode Function Status #1	Specifies function keys (F1-F8) enabled when loco addressed by its consist number	NMRA	0 - 255	0
CV22	Consist Mode Function Status #2	Specifies function keys (F0, F9-F12) enabled when loco addressed by consist number	NMRA	0 - 255	0
CV29	Configuration Register	See Section 4.2.4 for programming information.	NMRA	0 - 255	14[24]
CV66	Forward Trim	Scale factor for multiplying motor drive voltage when moving forward	NMRA	0 - 255	128
CV67 to CV94	User-defined Speed Steps 1 to 28	Specifies relative voltages applied to motor at each speed step	NMRA	0 - 255	
CV95	Reverse Trim	Scale factor for multiplying motor drive voltage when moving in reverse	NMRA	0 - 255	128

[22] Typical CV value; actual value varies among Atlas Gold Series locomotives equipped with LokSound Select decoders.
[23] The default value for CV17 is actually 192.
[24] See Section 4.2.4 for an explanation of why "14," rather than "6," is the default value.

Appendix 3. Some ESU-Specific CVs Used in LokSound Select Decoders[25]

CV	Name	Description	Source	Values 0f CV Bits		Range of Values	Atlas Default Value
CV31	Index Register High	Primary Index Register used in future for access to CVs CV257 to CV511 **To program the CVs discussed in this manual, you MUST ALWAYS have CV31 = 16.**	ESU			Currently Only 16	16
CV32	Index Register Low	Secondary Index Register ***required*** for access to CVs CV257 to CV511	ESU			0, 1, 2, 3	0
CV48	Master Sound Select	Selects sound sets for diesel engine horn, bell, and brake squeal	ESU			0 - 255	Depends on Locomotive
CV49	Extended Configuration #1	Additional Settings #1 for LokSound Select Decoders	ESU			0 - 255	19 = 16+2+1
		Purpose of Each Bit		**Bit #**	**Decimal Value**		
		Enable back EMF (0=disable, 1=enable)		0	1		
		Motor PWM frequency (0 = 20 kHz, 2 = 40 kHz)		1	2		
		Automatic DCC speed step detection. 16 = Enable automatic speed step detection		4	16		
CV63	Master Volume	Master volume control for all sound Effects. Don't set too high or audio clipping will occur.	ESU			0 - 192	192
CV122	Status Storage	Remember or not current function key status and current speed	ESU			0 -3	3: RS-3 & S-2 0: C424/C425 & RS-1
		Purpose of Each Bit		**Bit #**	**Decimal Value**		
		Function key status (0=forget, 1=remember)		0	1		
		Current speed (0=forget, 2=remember)		1	2		
CV124	Extended Configuration #2	Additional Settings #2 for LokSound Select Decoders	ESU			0 - 255	20[26]
		Purpose of Each Bit		**Bit #**	**Decimal Value**		
		Bit #0 ignored		0	1		
		Decoder lock using CV15 and CV16 (0 = disable, 2 = enable) :		1	2		
		Prime mover startup delay (0 = disable, 4 = enable)		2	4		
		Serial protocol for Marklin C Sinus (0 = disable, 8 = enable)		**3**	8		
		Regulation frequency (0 = adaptive, 16= constant)		4	16		
CV255 to CV511	Indexed CVs	The values of these CVs depend on the value of Index registers CV31 and CV32. Indexed CVs are used for physical output settings, volume control, and function mapping. A detailed description of these CVs can be found in Ref. [2]	ESU			0-255	

[25] Please see the *LokSound Select User Manual for Diesel and Steam Decoders* [2] for the definitions of the CVs ***not*** in this list.
[26] CV124 has a default value of ***4*** for the first run of the following three Atlas Gold Series locomotives with LokSound Select decoders (HO-scale RS-3, HO-scale S-2, and HO-scale C424/C425) but will have a default value of ***20*** for subsequent locomotives (HO-scale RS-1, N-scale S-2, and other future LokSound-equipped locomotives).

Appendix 4. Some Examples of LokSound® Select Sound-Decoder Programming

This appendix contains some examples of programming the CVs of an ESU LokSound® Select sound-decoder to change the behavior of an Atlas Gold Series diesel locomotive. Even if none of the following examples covers exactly what you want to do, you can learn about programming LokSound Select decoders by reading through some or all of these examples. The LokSound Select sound-decoder offers the user enormous flexibility to do whatever he/she desires to do. However, this flexibility comes at a price in the form of complexity of programming. The best way to handle this difficulty of programming is to use a computer program that handles the complexity for you, such as the *LokProgrammer* by ESU.

This section describes the general methodology for using the *LokProgrammer* software ***without needing to have the LokProgrammer hardware.*** Instead of using the LokProgrammer hardware, you can use the LokProgrammer software to print out the CV values to be changed and then use your own DCC system to enter these new CV values into the LokSound Select decoder that is installed in your locomotive.

It is ***essential*** to use in the LokProgrammer exactly the same ESU sound file that is installed in your locomotive. The reason for this statement is that the results of LokProgrammer CV calculations frequently change drastically when different sound files are used. **The exact files used in the factory equipped Atlas engines can be found on the ESU Soundfile Download page at the following web address:**

http://www.esu.eu/en/downloads/sounds/loksound-select/loksound-select-oem/

Set Up of LokProgrammer Software

1. The first step is to download the latest version of LokProgrammer software from the ESU website into your PC.
    a. Go to the ESU website:
        http://www.esu.eu/en/start/
    b. Choose *Downloads*, *Firmware and software*, *LokProgrammer PC software*, and finally *LokProgrammer PC-Software for 4th generation decoders,:* **Always use the most recent version of the LokProgrammer software and the one that has the latest date.**
    c. Single-click on the *Download* icon that is in the upper right corner of the box containing the name of the software that you wish to download (for example, *LokProgrammer PC-Software for 4th generation decoders*, Language: , Date: 29.07.14, Version: 4.4.11),
    d. Read the ESU license agreement and click on *Download* at the bottom.
    e. After the download is complete, (with Windows 7) select *Computer* and then *Downloads*.
    f. Double-click on the compressed *LokProgrammer_Setup* file that you just downloaded to UnZip and install it.

2. The second step is to download from the ESU website into your PC the LokSound Select sound file that is installed in your particular locomotive.
    a. Go again to the ESU website:
        http://www.esu.eu/en/start/
    b. Choose *LokSound Select Download Page*, *Files for OEM Equipped Locomotives*, and then look for the Sound File that is installed in your locomotive.
    c. Single-click on the black square (with a white “HO” inside) to install this sound file.
    d. Read the ESU license agreement and click on *Download* at the bottom.
    e. For computers with Windows 7, after the download is complete, select *Computer* and then *Downloads*.
    f. Double-click on the compressed *LokSSelect-Diesel-Atlas* file that you just downloaded in order to UnZip it. Then move the uncompressed file to a convenient (and easily remembered) directory on your computer.

Methodology for Using LokProgrammer Software without LokProgrammer Hardware

An overview of the process for using LokProgrammer software to calculate CV values to make specified changes follows.

- Double-click on the *LokSSelect-Diesel-Atlas* sound-set file that you intend to use. This operation will open the LokProgrammer software and load the selected sound file into the LokProgrammer.
- Listed in a column near the left of the screen are 15 categories of the functional operations where changes can be made to the behavior of LokSound Select sound-decoders. (Examples of these categories are *Address* and *Function outputs*.) Pick the category in which you wish to make changes and then single-click on the associated icon.
- Use the screen that opens to make the changes that you desire.
- Click on *Tools*. Under *Tools*, choose *Show changed CVs*.
- Select *Copy to clipboard*
- Copy the contents of the Clipboard to a Word document, and print this document
- Use this Word document, along with your DCC system, to program the changed CVs into your locomotive.
- If you wish to save the CV changes you just made, use the *Save As* command in LokProgrammer and a different file name to save the LokProgrammer project with the modifications that you made.

Note: ***With all programming involving the indexed CVs discussed in this User Manual, it is essential that the High Index Register CV31 remain set to its default value (CV31 = 16).***

The first three examples below are simple enough that they can be done quite easily without using LokProgrammer software. However, the last two examples are of sufficient complexity that they are best done with LokProgrammer software.

Example 1. Eliminate Prime Mover Startup Delay (DC and DCC)

This simple CV change eliminates the delay that prevents the locomotive from moving while the *Start-Up* sounds are playing. (Although the locomotive will now move as soon as the DC or DCC throttle is advanced, such motion is not prototypical since a real locomotive cannot move until after it has been started up.) The value to which CV124 must be set for this change depends on whether you wish the BEMF circuitry to use a *Variable Regulation Frequency* or a *Constant Regulation Frequency*. See Section 4.2.7 for more information on this topic.

For BEMF circuitry that uses a *Variable Regulation Frequency*, make the following CV value change:

Functionality to be Changed	Original Default CV Value (for Atlas locos)	Purpose of Original CV Value	New CV Value for Desired Functionality	Reason for Each CV Change
Disable prime mover start-up delay	CV124 = 4	Keeps locomotive from moving until start-up sounds complete	CV124 = 0	Allows locomotive to move even when the start-up sounds are playing

For BEMF circuitry that uses a *Constant Regulation Frequency*, make the following CV value change:

Functionality to be Changed	Original Default CV Value (for Atlas locos)	Purpose of Original CV Value	New CV Value for Desired Functionality	Reason for Each CV Change
Disable prime mover start-up delay	CV124 = 20	Keeps locomotive from moving until start-up sounds complete	CV124 = 16	Allows locomotive to move even when the start-up sounds are playing

Example 2. Reducing Volume of Diesel Engine Sound (DC and DCC)

Some modelers find that listening to the sound of the diesel engine (*Prime Mover*) for a long time is annoying. This example shows how to reduce the volume of the diesel engine sound. Note that this example and all the examples that follow use *Indexed Configuration Variables*. Please refer back to Section 4.2.2 for information on using Indexed CVs.

Functionality to be Changed	Original Default CV Value (for Atlas locos)	Purpose of Original CV Value	New CV Value for Desired Functionality	Reason for Each CV Change
Reduce prime mover (diesel engine) volume by about half	CV31 = 16 CV32 = 1 CV259 = 99	Set index registers Sets prime mover sound volume at (99/128) of max vol.	CV31 = 16 CV32 = 1 CV259 = 49	Set index registers Reduces prime mover sound volume to (49/128) of max vol.

Example 3. Keep Prime Mover Sound Off Until Press F8 (DCC only)

In order to reduce the level of noise in your layout room from locomotives that are not being used, you may wish to configure a locomotive so that there is no *Prime Mover* (diesel engine) sound until the operator presses the F8 key.

Functionality to be Changed	Original Default CV Values (for Atlas locos)	Purpose of Each Original CV Value	New CV Values for Desired Functionality	Reason for Each CV Change
Change behavior so that prime mover sound is normally off unless turned on using F8	CV31 = 16 CV32 = 2	Set index registers	CV31 = 16 CV32 = 2	Set index registers
	CV403 = 32	Sets prime mover sound to be normally on	CV403 = 16	Sets prime mover sound to be normally off
	CV13 = 0	Keeps sound on in DC	CV13 = 128	Keeps sound off in DC

Example 4. Move Dynamic Brake Function Mapping from Atlas Default of F5 to Tsunami Default of F4

If, for example, you just purchased an Atlas Gold Series C424/C425 locomotive (with a LokSound Select decoder), but already have a number of sound-equipped locomotives that are equipped with Soundtraxx Tsunami sound-decoders, you might prefer to have the dynamic brake fan sound in your Atlas C424/C425 controlled by function F4 as it is in Tsunami sound-decoders (instead of F5 as it is in most other Atlas Gold Series locomotives). If you want the dynamic brake sound to be controlled by F4, you will need to program the CV values shown in the table below.

Functionality to be Changed	Original Default CV Values (for Atlas locos)	New CV Values for Desired Functionality	Reason for Each CV Change
Move dynamic brake fan control from F5 to F4 *and* Move radiator fan control from F4 to F5	CV31 = 16 CV32 = 2 CV337 = 0 CV348 = 0 CV349 = 0 CV350 = 128 CV353 = 1 CV364 = 4 CV365 = 128 CV366 = 32	CV31 = 16 CV32 = 2 CV337 = 1 CV348 = 4 CV349 = 128 CV350 = 32 CV353 = 0 CV364 = 0 CV365 = 0 CV366 =128	Set index registers Move dynamic brake fan control from F5 to F4 *and* Move radiator fan control from F4 to F5

For DCC function re-mapping (as discussed in this example), Atlas strongly recommends that you use ESU LokProgrammer software to calculate the CV values to be programmed.

The CVs and CV values shown in the above table are the end result of using LokProgrammer software to interchange DCC functions *F4* and *F5*. The various steps involved in this process are described below:

- After you have downloaded the *LokSSelect-Diesel-Atlas* sound-set file that you intend to use, double-click on it in order to open the LokProgrammer software and load the selected file.
- On the LokProgrammer screen, click on *Function mapping*. You will see the DCC function mappings that are currently in effect.
- *(Optional)* For future reference, you may wish to make a paper copy of the default LokProgrammer *Function mapping* screen. To make this copy, proceed as follows
    - Highlight the table showing these mappings (or at least the top part of the table down to the mapping for function key F5);
    - Copy the highlighted area to your clipboard;
    - Past the clipboard contents into Microsoft Word;
    - Print the resulting Word document.

The top portion of the *Function mapping* table (for the Atlas Gold Series HO C424/C425 locomotive) will look like this before you make any changes:

Conditions	Physical outputs	Logical functions	Sounds
Forward, F0	Front light [1]	-	-
Reverse, F0	Rear light [1]	-	-
F1	-	-	Bell
F2	-	Grade crossing	Playable air horn
F3	-	-	Coupler
F4	-	-	Fan Sound
Drive, F5	-	Dynamic brake, Shift Mode	Dynamic Brake

The first step is to make all the *Function mapping* table entries in the row labeled *F4* look exactly like the *current* table entries for the *F5* row.

- Single-click on the cell in the *Conditions* column that is labeled *F4*. in the LokProgrammer *Function mapping* table. This clicking action will cause a down arrow in a grey box to appear. Click on this down arrow. A new set of labeled grey boxes will appear.
    - Since you want to add *Driving* to the Conditions for *F4* to make it match the current (default) entry for *F5*, click on the down arrow in the box to the right of the *Driving* label. Then click on Yes in the grey box to make *Driving* a condition.
- Now swatch your attention to the *Logical functions* column of the *F4* row.
    - Since you want to add *Dynamic brake* to the Logical functions for *F4* to make it match the current (default) entry for *F5*, click on the (currently blank) cell at the intersection of *Drive, F4* and *Logical functions* to make a down arrow in a grey box appear. Then click on this down arrow. Scroll down until you find *Dynamic brake*. Click in the box to the left of *Dynamic brake* to select *Dynamic brake* as the first Logical function.
    - Now click on click on the down arrow to the right of *Dynamic brake* in this same cell. Scroll down until you find *Shift mode*. Click in the box to the left of *Shift mode* to select *Shift mode* as the second Logical function.
- Now work on the *Sounds* column of the *F4* row.
    - Since you want to change the sound triggered by *F4* from *Fan Sound* to *Dynamic Brake*, click on the cell at the intersection of the *Drive, F4* row and the *Sounds* column to make a down arrow appear.
    - Check the box to the left of *Sound slot 6: Dynamic Brake* to make the *Dynamic Brake* sound play when the *F4* key is pressed*;*
    - Uncheck the box to the left of *Sound slot 8: Fan sound* to stop the *Fan* sound from playing when the *F4* key is pressed*.*

The top portion of the *Function mapping* table (for the Atlas Gold Series HO C424/C425 locomotive will look like this after you have made the above changes to the *F4* row:

Conditions	Physical outputs	Logical functions	Sounds
Forward, F0	Front light [1]	-	-
Reverse, F0	Rear light [1]	-	-
F1	-	-	Bell
F2	-	Grade crossing	Playable air horn
F3	-	-	Coupler
Drive, F4	-	Dynamic brake, Shift Mode	Dynamic Brake
Drive, F5	-	Dynamic brake, Shift Mode	Dynamic Brake

The second step is to make all the table entries in the *F5* row look exactly like those for the *F4* row in the original (default) *Function mapping* table.

- Starting with the *F5* row in the LokProgrammer *Function mapping* table, click on the cell labeled *Drive, F5* and then click on the down arrow in this same cell in the *Conditions* column.
  - Since you want to remove *Driving* from the Conditions for *F5* to make it match the original (default) entry for *F4*, click on the down arrow in the box to the right of *Driving*. Then click on *Ignore* so that *Driving* will no longer be a condition.
- Now swatch your attention to the *Logical functions* column of the *F5* row.
  - Since you want to remove *Dynamic brake* from the Logical functions for *F*5 to make it match the original (default) entry for *F4,* click on the cell in the *Logical functions* column and the *F5* that is currently labeled *Dynamic brake, Shift Mode* to make a down arrow appear. Then click on this down arrow. Scroll down until you find *Dynamic brake*. Uncheck the box to the left of *Dynamic brake* to remove *Dynamic brake* as a Logical function.
  - Now scroll down until you find *Shift mode*. Uncheck the box to the left of *Shift mode* to remove *Shift mode* as a Logical function.
- Now work on the *Sounds* column of the *F5* row.
  - Since you want to change the sound triggered by *F5* from *Dynamic Brake* to *Fan Sound*, click on the cell at the intersection of the *F5* row and the *Sounds* column to make a down arrow appear.
  - Uncheck the box to the left of *Sound slot 6: Dynamic Brake* to stop the *Dynamic Brake* sound from playing when the *F5* key is pressed*;*
  - Check the box to the left of *Sound slot 8: Fan sound* to make the *Fan* sound play when the *F5* key is pressed.

The top portion of the *Function mapping* table (for the Atlas Gold Series HO C424/C425 locomotive will look like this after you have made all of the above changes to both the *F4* row and the *F5* row.

Conditions	Physical outputs	Logical functions	Sounds
Forward, F0	Front light [1]	-	-
Reverse, F0	Rear light [1]	-	-
F1	-	-	Bell
F2	-	Grade crossing	Playable air horn
F3	-	-	Coupler
Drive, F4	-	Dynamic brake, Shift Mode -	Dynamic Brake
F5	-		Fan Sound

The third and final step is to document the CVs that have changed so that you can make the necessary modifications to the CVs in your locomotive using your DCC system. Assuming that you are still on the *Function mapping* screen of LokProgrammer, do the following:

- Click on *Tools*. Under *Tools*, choose *Show changed CVs*. You will see the following information displayed:

```
CV31 = 16, CV32 = 2
----------
CV337 =   1
CV348 =   4
CV349 = 128
CV350 = 32
CV353 =   0
CV364 =   0
CV365 =   0
CV366 = 12
```

  Note that the CV values listed above are exactly the same as the entries in the third column of the table on page 36.
- Now select *Copy to clipboard*
- Copy the contents of the Clipboard to a Word document, and print this document
- Use this Word document, along with your DCC system, to program the above CV values into your Atlas Gold Series HO C424/C425 locomotive.

Once you do this programming, you will find that function *F4* now controls the *Dynamic Brake fan* sound effect, and function *F5* now controls the *Radiator fan* sound effect,

Example 5. Change Operation of Headlights

LokSound Select sound-decoders provide a great deal of flexibility in headlight operation. The following example shows how to change the behavior of the headlights from the default behavior for yard and local switching locomotives:

> *Rule 17*: Both headlights are turned on their *Dim* states when the locomotive is stopped. When moving, the headlight in the direction of movement switches to its *Bright* state.

to the following behavior:

> *Directional with Rule 17*: The headlight in the direction in which the locomotive is moving (forward or reverse) is *On* in its *Bright* state; this headlight changes to its *Dim* state when the locomotive is stopped. The headlight in opposite direction of movement (or potential movement) is *Off.*

The original Atlas default headlight behavior includes the following two features:

- A headlight that is on *Bright* may be dimmed with the *F12* DCC function key.
- The LED brightness changes between off and on (or vice versa) and between *Dim* and *Bright* (or vice versa) are gradual rather than abrupt (*fade-in/fade-out*).

The new CV values given below keep the above two features.

Note that the front and rear headlights are programmed separately. As in Example 4, Atlas strongly recommends that you use the ESU LokProgrammer software to calculate the CV values to be programmed. The CV values needed to make both the front and rear headlights directional (but maintaining Rule 17 operation) are listed below.

Front Headlight

Functionality to be Changed	Original Default CV Values (for Atlas locos)	Purpose of Each Original CV Value	New CV Values for Desired Functionality	Reason for Each CV Change
Change Front Headlight from *Rule 17*:	CV31 = 16 CV32 = 2	Set index registers	CV31 = 16 CV32 = 2	Set index registers
to *Directional with Rule 17*	CV257 = 16	Front headlight *ON* in both directions unless switched *OFF* with F0	CV257 = 20	Set front headlight to be *ON* in forward and *OF*F in reverse

Rear Headlight

Functionality to be Changed	Original Default CV Values (for Atlas locos)	Purpose of Each Original CV Value	New CV Values for Desired Functionality	Reason for Each CV Change
Change Rear Headlight from *Rule 17*:	CV31 = 16 CV32 = 2	Set index registers	CV31 = 16 CV32 = 2	Set index registers
to *Directional with Rule 17*	CV273 = 16	Rear headlight *ON* in both directions unless switched *OFF* with *F0*	CV273 = 24	Set Rear headlight to be *ON* in forward and *OF*F in reverse

To use the LokProgrammer software to determine the CVs that must be changed and the resulting new CV values proceed as follows:

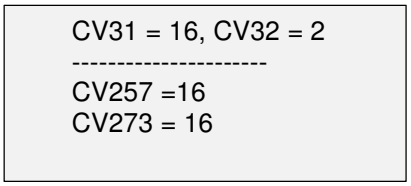
- Open LokProgrammer with the sound set for the Atlas locomotive whose behavior you wish to modify. (You can download this sound set from the LokSound Select webpage.)
- Go to the *Function mapping* pane
  - To change the behavior of the Front Headlight:
    - In the *Conditions* column, click on the cell that is currently labeled *F0* and is located immediately to the left of the cell in the *Physical outputs* column that is labeled *Front light (1)*. Doing this operation will open a down arrow in a grey box within this cell.
    - Click on the down arrow.
    - Click on the down arrow in the box to the right of *Direction*
    - Click on *Forward*
  - To change the behavior of the Rear Headlight:
    In the *Conditions* column, click on the cell that is currently labeled *F0* and is located immediately to the left of the cell in the *Physical outputs* column that is labeled *Rear light (1)*. Doing this operation will open a down arrow in the cell.
    - Click on the down arrow in on the cell labeled *F0*
    - Click on the down arrow in the box to the right of *Direction*
    - Click on *Reverse*
- Click on *Tools*. Under *Tools*, choose *Show changed CVs*. You will see the following information displayed:

```
CV31 = 16, CV32 = 2
----------------------
CV257 = 20
CV273 = 24
```

- Select *Copy to clipboard*
- Copy the contents of the Clipboard to a Word document, and print this document
- Use this Word document, along with your DCC system, to program the changed CVs into your locomotive.
- If you wish to save the CV changes you just made, use the *Save As* command in LokProgrammer and a different file name to save the LokProgrammer project.

To do the reverse operation (e.g., make the directional headlights in a C424/C425 match the default headlight behavior in an RS-3), proceed as follows:

- Open LokProgrammer with the C424/C425 sound set (download sound set from LokSound Select webpage)
    - To change the behavior of the Front Headlight:
        - In the *Conditions* column, click on the cell that is currently labeled *Forward*, *F0* and is located immediately to the left of the cell in the *Physical outputs* column that is labeled *Front light (1)*. Doing this operation will open a down arrow in a grey box in this cell.
        - Click on the down arrow in on the cell labeled *Forward*, *F0*
        - Click on the down arrow in the grey box to the right of *Direction*
        - Click on *Ignore*
    - To change the behavior of the Rear Headlight:
        - In the *Conditions* column, click on the cell that is currently labeled *Forward*, *F0* and is located immediately to the left of the cell in the *Physical outputs* column that is labeled *Rear light (1)*. Doing this operation will open a down arrow in a grey box in this cell.
        - Click on the down arrow in on the cell labeled *F0*
        - Click on the down arrow in the box to the right of *Direction*
        - Click on *Ignore*
- Click on *Tools*. Under *Tools*, choose *Show changed CVs*. You will see the following information displayed



- Select *Copy to clipboard*
- Copy the contents of the Clipboard to a Word document, and print this document
- Use this Word document, along with your DCC system, to program the changed CVs into your locomotive.
- If you wish to save the CV changes you just made, use the *Save As* command in LokProgrammer and a different file name to save the LokProgrammer project with the changes you made.

Appendix 5. Considerations for Programming CVs Numbered over 255

Certain Digitrax and NCE DCC systems do not allow programming of CVs numbered above 255. In particular, the following DCC systems are currently not capable of programming of CV 256 through CV511:

- The Digitrax Zephyr or Zephyr xtra with a DT400 throttle,
- Digitrax Super Chief or Empire Builder with a DT400 throttle,
- NCE Power Pro in Service Mode (programming on the program track).

The following Digitrax and NCE DCC systems DO allow programming of CV 256 through CV511:

- Digitrax Zephyr or Zephyr xtra with a DT402 throttle,
- Digitrax Super Chief or Empire Builder with a DT402 throttle,
- NCE Power Cab in either Service Mode or Ops Mode,
- NCE Power Pro in Ops Mode (programming on the main track).

In order to make full programming of LokSound Select decoders possible, ESU has implemented an assistance tool. Since the higher-numbered CVs cannot be reached, this tool asks you to write the number of the desired CV temporarily into two assisting CVs (called the *Address Offset* and *Address* registers). After programming these first two CVs, the user programs the desired value for the CV numbered above 255 into a third assisting CV (called the *Value* register). After the Value register has been written, the LokSound Select decoder automatically copies the contents of the Value register to the actual desired CV that is numbered above 255 and sets the values of the three assisting CVs back to 0. To summarize, three CVs have to be programmed to write the value of one CV numbered above 255.
These three CVs are described in the following table:

CV	Name	Description	Value Range
96	Address Offset	Saves the hundreds digit of the CV number that you wish to program	0 – 9
97	Address	Saves the units and tens digits of the CV number that you wish to program	0-99
99	Value	Saves the value of the CV that you wish to program	0-255

Example: You wish to program CV 317 with the value 120. Proceed as follows:

- Program the value of the CV number in hundreds in CV 96.
  - In this example, CV 96 = 3.
- Program the value of the CV number in units and tens in CV 97
  - In our example, CV 97 = 17.
- Program the desired value into CV 99.
  - In our example, CV 99 = 120.

As soon as you have programmed CV 99, the value of CV 99 will be transferred by the LokSound Select decoder into CV 317. When the programming finished, CVs 96, 97 and 99 will be set back to 0 automatically.

This procedure is ONLY needed when programming CVs numbered above 255 on a DCC system that does not allow programming of CVs numbered above 255.

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